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WAR MACHINE

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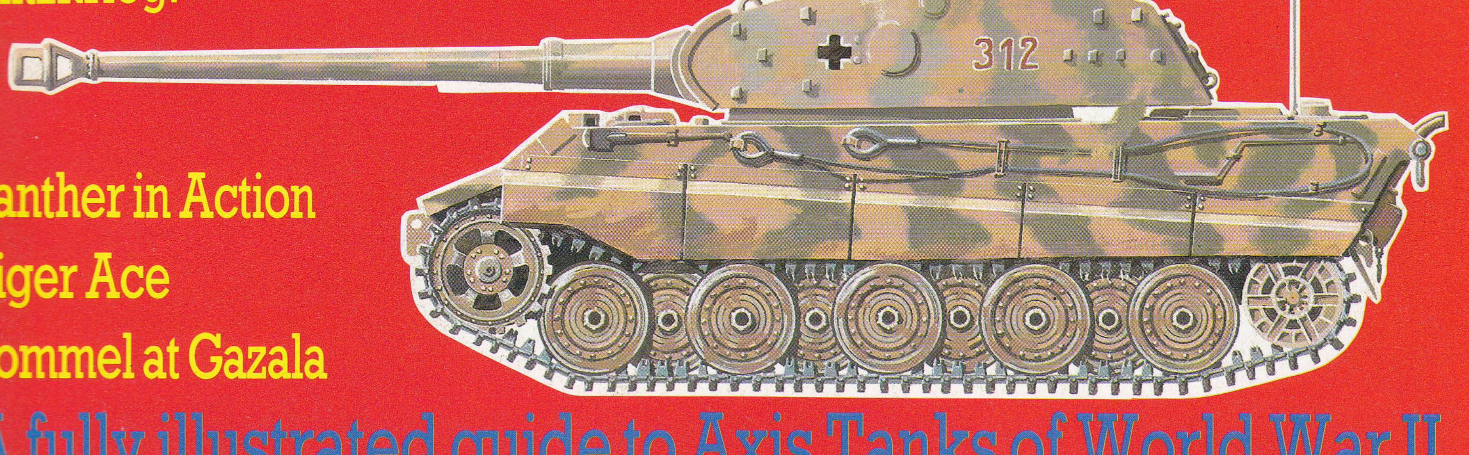
Armed Forces of the World: French Air Force (Part 2)

Blitzkrieg!



Panther in Action

Tiger Ace

Rommel at Gazala

A fully illustrated guide to Axis Tanks of World War II

WAR MACHINE

Volume 3 **Issue 26**

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Armed Forces of the World

French Air Force (Part 2) iii

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- Modern Cruisers

Axis Tanks of World War 11

German infantry and a Panzer III in the USSR during the invasion of 1941. Contrary to popular belief, it was the methods the Germans used and not the size and number of their tanks which brought them their early victories.

By the end of World War I the tank was a familiar sight on the battlefield; it took the power of the German Blitzkrieg to convince conventional military thinking that the tank, and more importantly its method of use, can have a profound effect upon the outcome of a battle.

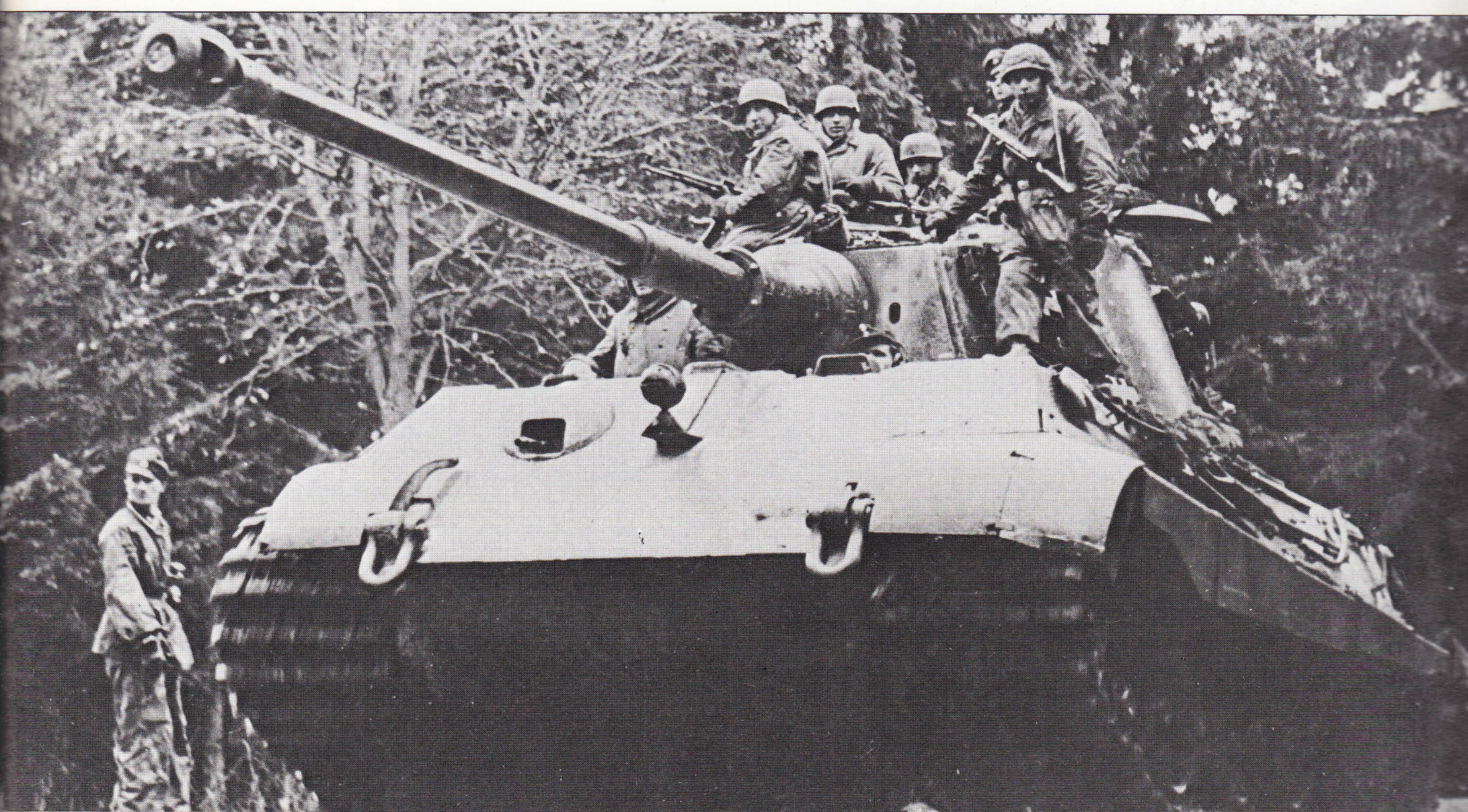
Although Italy and Japan produced significant numbers of tanks before and during World War II, it is the German tanks which are best known. At the outbreak of the war the Panzerkampfwagen (PzKpfw) I and PzKpfw II were the most common models, but within a few years these had been phased out of service and replaced by the PzKpfw III and PzKpfw IV. The latter had the distinction of remaining in production throughout the war. It was an excellent design that proved to be capable of being upgunned and uparmoured to meet the changing battlefield threat. The Panther and Tiger arrived on the scene towards the end of the war, but these could not be produced in anything like the required numbers as a result of shortages in materials and manpower and of the effectiveness of Allied bombing on German plants, even though many of these had been dispersed early in the war. The Panther and Tiger were rushed into production without proper trials, however, and many were lost during their initial deployments as a result of mechanical breakdown rather than direct enemy action. The Tiger was in particular a very heavy tank and lacked mobility on the battlefield. Its armour protection and gun were first class, and this tank proved a difficult one to destroy on both the Eastern and Western Fronts. Often four Shermans would be required to neutralize just one Tiger: two would try and draw its fire, often being knocked out in the process, while the others worked round its flanks and attacked it from its more vulnerable sides. Towards the end of World War II Germany turned its attention to producing more and more tank destroyers as by that time the German army was on the defensive, and these vehicles were quicker, easier and cheaper to produce than tanks such as the Panther and Tiger.

While some of the Italian tanks were fairly modern in 1939, by the early part of Italy's war they had become completely obsolete. The better armed and armoured P 40 heavy tank never entered service with the Italian army, although a few were taken over by the Germans.

Japan used tanks during the invasion of China before World War II as well as during the Far Eastern campaigns from 1941. As few Allied AFVs were available at that time the Japanese vehicles were quite adequate, the more so as their primary role was infantry fire support rather than tank-against-tank operations.

Czech tanks are included, as many were subsequently taken over by the Germans during the invasion of France in 1940 and remained in production in Czechoslovakia after its occupation.

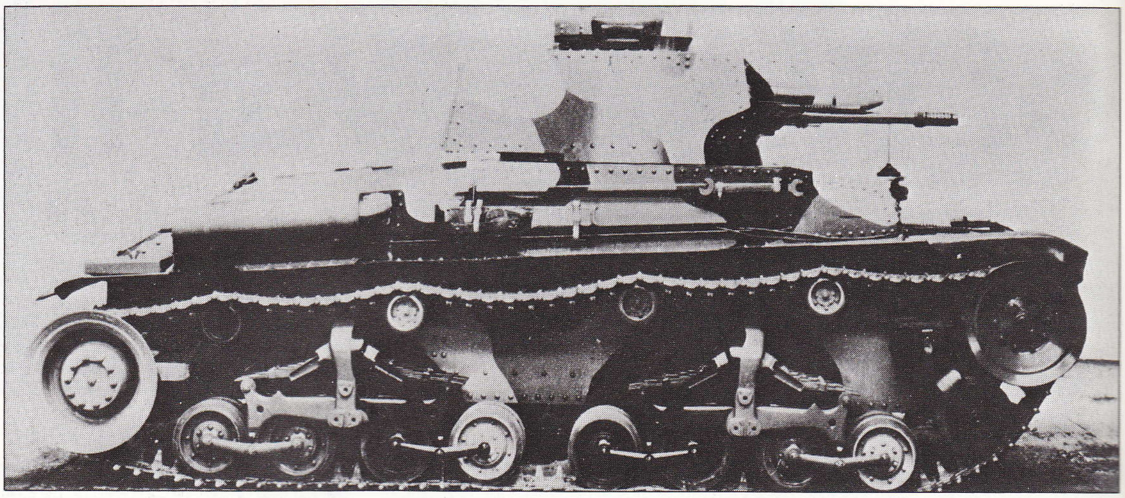
The years of World War II saw a phenomenal development in armoured fighting vehicles, and by the time of the Ardennes offensive Germany was fielding the enormously powerful Königstiger, *known to the Allies as the 'Royal Tiger'.*



CZECHOSLOVAKIA

LT vz 35 light tank

In October 1934 the Czech army placed an order for two prototypes of a medium tank called the **S-11-a** (or **T-11**) which were completed in the following year. Army trials with these vehicles started in June 1935 and soon uncovered many faults as a result of the tank's rushed development. Without waiting for these faults to be corrected an order was placed for a first batch of 160 vehicles in October 1935, and the first five of these were delivered in the following year. So many faults were found with these vehicles that these were returned to Skoda for modifications. A further batch of 138 was ordered for the Czech army, which called it the **LT vz 35**, while Romania ordered 126 under the designation **R-2**. Gradually most of the faults were overcome and the vehicle gained a good reputation. The Germans took over the remaining vehicles under the designation **Panzerkampfwagen 35(t)**, and a further 219 were built specifically for the German army in the Skoda works. Such was the shortage of tanks in the German army at that time that the 6th Panzer Division was equipped with the PzKpfw 35(t) in time to take part in the invasion of France in 1940. These continued in service until 1942 when most of these were converted into other roles such as mortar tractors (German designation *Mörserzugmittel*), artillery tractors (German designation *Zugkraftwagen*) or maintenance vehicles with tank battalions. It is often not realized that Czechoslovakia was a leading exporter of armoured vehicles and artillery prime movers before World War II, with sales made to Austria, Bulgaria, Hungary, Latvia, Peru, Romania, Sweden, Switzerland and Turkey.



Czechoslovakia provided many of the tanks used by the Wehrmacht in the battle for France. The Pz 35(t) equipped the 6th Panzer Division in that campaign, and some tanks continued in service until 1942.

The hull of the LT vz 35 was of riveted construction that varied in thickness from 12 mm (0.47 in) to a maximum of 35 mm (1.38 in). The bow machine-gunner was seated at the front of the vehicle on the left and operated the 7.92-mm (0.31-in) ZB vz 35 or 37 machine-gun, with the driver to his right. The commander/gunner and loader/radio operator were seated in the two-man turret in the centre of the hull. Main armament consisted of a 37.2-mm Skoda vz 34 gun with a 7.92-mm (0.31-in) ZB 35 or 37 machine-gun mounted co-axially to the right. Totals of 72 rounds of 37 mm and 1,800 rounds of machine-gun ammunition were carried. The engine and transmission were at the rear of the hull, the transmission having one reverse and six forward gears. The suspension on each side consisted of eight small road wheels (two per bogie), with the drive sprocket at the rear, and idler at the front; there were four track-return rollers.

An unusual feature of the tank was that the transmission and steering were assisted by compressed air to reduce driver fatigue, so enabling the tank to travel long distances at high speed. Problems were encountered with these systems when the tanks were operated by the Germans on the Eastern Front because of the very low temperatures encountered.

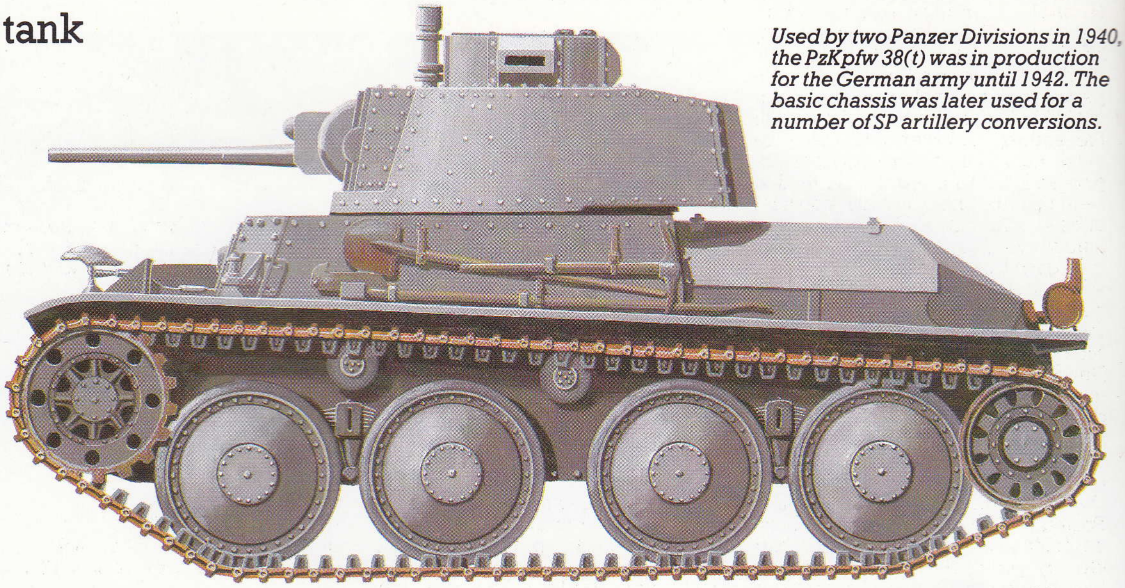
Specification

LT vz 35
Crew: 4
Weight: 10500 kg (23,148 lb)
Dimensions: length 4.9 m (16 ft 1 in); width 2.159 m (7 ft 1 in); height 2.209 m (7 ft 3 in)
Powerplant: one Skoda six-cylinder water-cooled petrol engine developing 120 hp (89 kW)
Performance: maximum road speed 40 km/h (25 mph); maximum range 193 km (120 miles); fording 0.8 m (3 ft 4 in); gradient 60 per cent; vertical obstacle 0.787 m (2 ft 7 in); trench 1.981 m (6 ft 6 in)

CZECHOSLOVAKIA

TNH P-S light tank

In 1937 the international situation was rapidly deteriorating, so the Czech army issued a requirement for a new light tank. This time the army was determined that the troubles encountered with the LT vz 35 light tank when it entered service, resulting from a lack of testing, would not be repeated. Skoda entered its S-11-a and S-11-b, while CKD entered an LT vz 35 with the engine and transmission of the TNH tank, the LTL, the **TNH P-S** (already produced for export) as well as a new medium tank called the V-8-H. During the extensive trials the TNH P-S was found to be the best design and on 1 July 1938 was adopted as the standard light tank of the Czech army under the designation **LT vz 38**, but none had entered service at the time of the German occupation in 1939. The vehicle remained in production for the German army between 1939 and 1942, more than 1,400 being built under the designation **Panzerkampfwagen 38(t) Ausf S** to **PzKpfw 38(t) Ausf G.** (*Ausführung* is the German word for model or mark.) The Germans also exported 69 vehicles to Slovakia, 102 to Hungary, 50 to Romania and 10 to Bulgaria. During the invasion of France the tank was used by the 7th and 8th Panzer Divisions, and continued in service as a light tank until 1941-2.



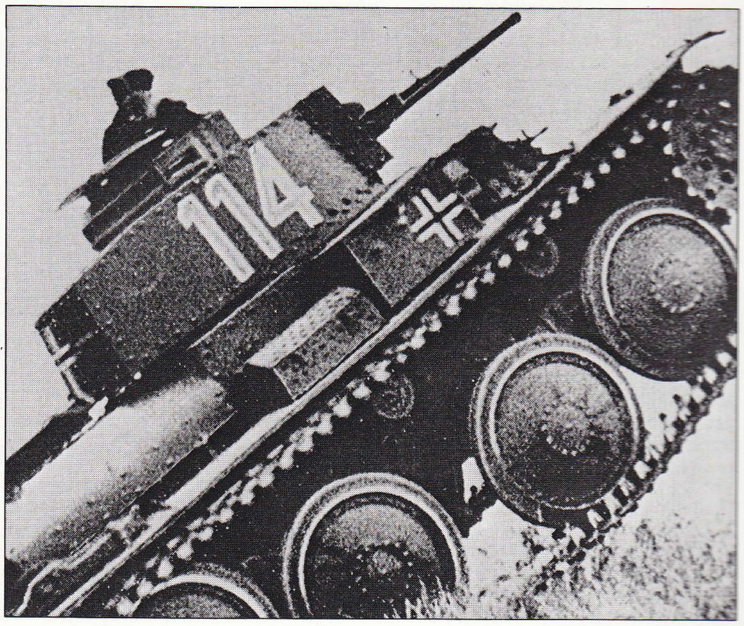
Used by two Panzer Divisions in 1940, the PzKpfw 38(t) was in production for the German army until 1942. The basic chassis was later used for a number of SP artillery conversions.

The hull and turret of the vehicle were of riveted construction, the top of the superstructure being bolted into position. Minimum armour thickness was 10 mm (0.4 in) and maximum thickness 25 mm (1 in), although from the Ausf E this was increased to 50 mm (1.96 in). The driver was seated at the front of the tank on the right, with the bow machine-gunner to his left and operating the 7.92-mm (0.31-in) MG 37(t) machine-gun. The two-man turret was in the centre of the hull and armed with a 37.2-mm Skoda A7 gun, which could fire both armour-piercing and HE rounds with an elevation of +12° and a depression of −6°. Mounted co-axial with and to the right of the main armament was another 7.92-mm (0.31-in) machine-gun. Totals of 90 rounds of 37-mm and 2,550-rounds of machine-gun ammunition were carried. The engine was at the rear of the hull and coupled to a transmission with one reverse and five forward gears. Suspension on each side consisted of four large rubber-tyred road wheels suspended in pairs on leaf springs, with the drive sprocket at the front and idler at the rear, and with two track-return rollers.

When outclassed as a tank the PzKpfw 38(t) was widely used as a reconnaissance vehicle, and the Germans even fitted some chassis with the turret of the SdKfz 222 light armoured car complete with its 20-mm cannon.

The chassis of the light tank was also used as the basis for a large number of vehicles including the **Marder** tank destroyer, which was fitted with a new superstructure armed with 75-mm (2.95-in) anti-tank gun, various self-propelled 15-cm (5.9-in) guns, a 20-mm self-propelled anti-aircraft gun, several types of weapons carriers and the **Hetzer** tank destroyer, to name just a few. The last was armed with a 75-mm (2.95-in) gun in a fully enclosed fighting compartment with limited traverse, and was considered by many to be one of the best vehicles of its type during World War II. A total of 2,584 was built between 1944 and 1945, and production continued after the war for the Czech army, a further 158 being sold to Switzerland in 1946-7 under the designation **G-13**. These were finally withdrawn from service in the late 1960s.

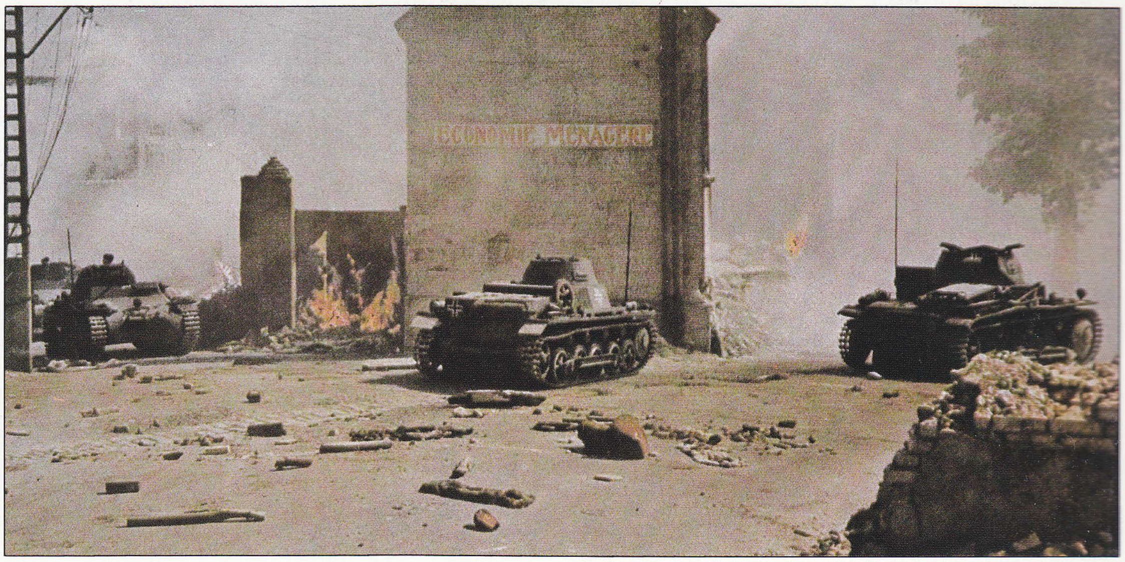
Specification
TNH P-S
Crew: 4
Weight: 9700 kg (21,385 lb)
Dimensions: length 4.546 m (14 ft 11 in); width 2.133 m (7 ft 0 in); height 2.311 m (7 ft 7 in)
Powerplant: one Praga EPA six-cylinder water-cooled inline petrol engine developing 150 hp (112 kW)
Performance: maximum road speed 42 km/h (26 mph); maximum range 200 km (125 miles); fording 0.9 m (3 ft); gradient 60 per cent; vertical obstacle 0.787 m (2 ft 7 in); trench 1.879 m (6 ft 2 in)



A PzKpfw 38(t) during the invasion of France; the 7th and 8th Panzer Divisions used the tank. The commander of the 7th Division became well known later in the war – his name was Rommel.

GERMANY

Panzerkampfwagen I light tank



Above: Two PzKpfw Is and a heavier PzKpfw III in France in 1940. 523 of the little light tanks were used in the campaign, in spite of their unsuitability for combat.

In 1933 the German Army Weapons Department issued a requirement for a light armoured vehicle weighing about 5000 kg (11,025 lb) that could be used for training purposes, and five companies subsequentlay built prototype vehicles. After trials the Army Weapons Department accepted the Krupp design for further development, the design company being responsible for the chassis and Daimler-Benz for the superstructure. To conceal the real use of the vehicle the Army Weapons Department called the vehicle the **Landwirtschäftlicher Schlepper** (industrial tractor). The first batch of 150 vehicles was ordered from Henschel, and production commenced in July 1934 under the designation **PzKpfw I(MG) (SdKfz 101) Ausf A** and powered by a Krupp M 305 petrol engine developing only 57 hp (42 kW). There were problems with the engine, however, and the next-batch Ausf B had a more powerful engine which meant that the hull had to be longer and an additional roadwheel added on each side. This model was a little heavier, but its more powerful engine gave it a maximum road speed of 40 km/h (25 mph). This entered service in 1935 under the designation of the **PzKpfw 1(MG) (SdKfz 101) Ausf B**. Most of the vehicles were built by Henschel but Wegmann also became involved in the programme, peak production being achieved in 1935 when over 800 vehicles were completed.

The Panzerkampfwagen 1 was first used operationally in the Spanish Civil War, and at the start of the invasion of Poland in 1939 no less than 1,445 such vehicles were on strength. It had already been realized, however, that the vehicle was ill-suited for front-line use because of its lack of firepower and armour protection (7-13 mm/0.28-0.51 in), and in the invasion of France in 1940 only 523 were used, although many more were still in Germany and Poland. By the end of 1941 the PzKpfw I had been phased out of front-line service, although the **kleiner Panzerbefehlswagen I (SdKfz 265)** command model remained in service longer.

Once the light tank was obsolete its chassis underwent conversion to other roles, and one of the first of these was the **Munitions-Schlepper** used to carry ammunition and other valuable cargoes. For the anti-tank role the chassis was fitted with captured Czech 47-mm anti-tank guns on top of the superstructure with limited traverse. These were used on both the Eastern and North African fronts, but soon became obsolete with the arrival of the more heavily armoured tanks on the battlefield. The largest conversion entailed the installation of a 15-cm (5.9-in) infantry gun in a new superstructure, but this really overloaded the chassis and less than 40 such conversions were made.

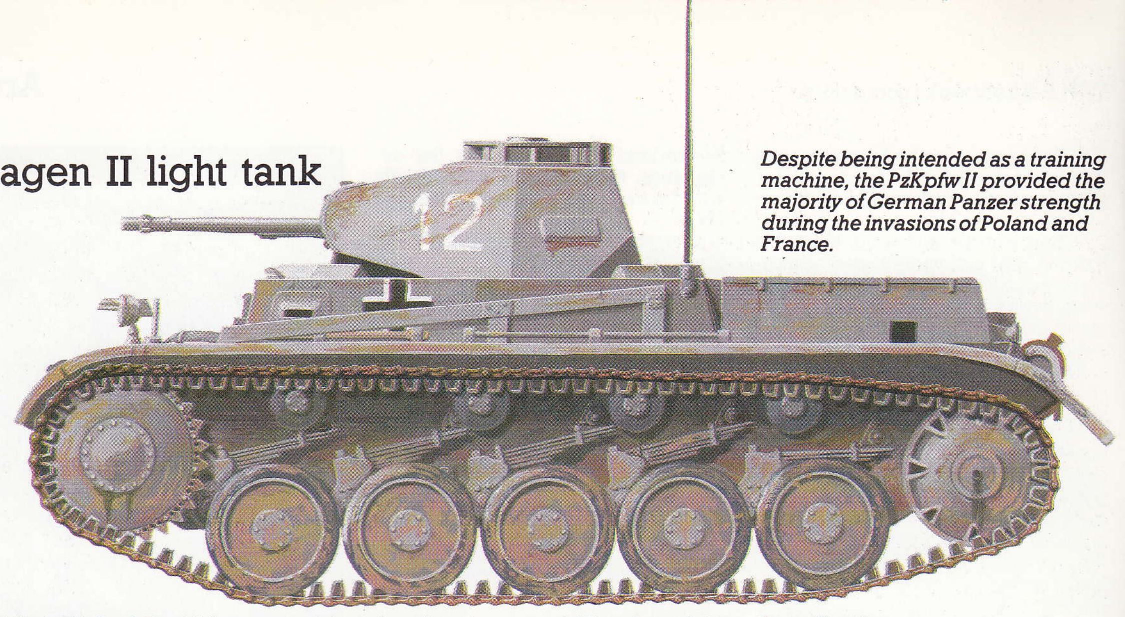
The turret was in the centre of the vehicle, offset to the right and armed with twin 7.92-mm (0.31-in) machine-guns, for which a total of 1,525 rounds of ammunition were carried. The driver was seated to the left of the turret.

Right: The PzKpfw I was heavily involved in the Polish campaign after its operational debut in the Spanish Civil War.

Specification
PzKpfw I Ausf B
Crew: 2
Weight: 6000 kg (13,230 lb)
Dimensions: length 4.42 m (14 ft 6 in); width 2.06 m (6 ft 9 in); height 1.72 m (5 ft 8 in)
Powerplant: one Maybach NL 38 TR six-cylinder petrol engine developing 100 hp (75 kW)
Performance: maximum road speed 40 km/h (25 mph); maximum road range 140 km (87 miles); fording 0.58 m (1 ft 11 in); gradient 60 per cent; vertical obstacle 0.36 m (1 ft 2 in); trench 1.4 m (4 ft 7 in)

GERMANY

Panzerkampfwagen II light tank



Despite being intended as a training machine, the PzKpfw II provided the majority of German Panzer strength during the invasions of Poland and France.

To bridge the gap until the arrival of the PzKpfw III and PzKpfw IV tanks, a decision was made in 1934 to order an interim model which became known as the **Panzerkampfwagen II**. Development contracts were awarded to Henschel, Krupp and MAN under the designation Industrial Tractor 100 (**LaS 100**) to conceal its true role. After evaluation of these prototypes the MAN model was selected for further development, MAN being responsible for the chassis and Daimler-Benz for the superstructure. Production was eventually undertaken also by Famo, MIAG and Wegmann, and the tank formed the backbone of the German armoured divisions during the invasion of France, about 1,000 being in front line service. The tank was also used in the invasion of the USSR in the following year although by that time it was obsolete, had inadequate armour protection and lacked firepower. It was in fact intended primarily as a training machine rather than for actual combat.

The first production **PzKpfw II Ausf A** vehicles were delivered in 1935, and were armed with a 20-mm cannon and 7.92-mm (0.31-in) co-axial machine-gun. There was a three-man crew, and combat weight was 7.2 tonnes. Tests with the early production models showed that the vehicle was underpowered with its 130-hp (97-kW) engine, so the **PzKpfw II Ausf B** was introduced with a 140-hp (104-kW) engine and other improvements (notably thicker frontal armour) which pushed up its weight to just under 8 tonnes. The **PzKpfw II Ausf C** was introduced in 1937, and had better armour protection. Additionally, the small bogie wheels were replaced by five independently-sprung bogies with leaf springs on each side, and this was to remain the basic suspension for all remaining production vehicles. In 1938 the **PzKpfw II Ausf D** and **PzKpfw II Ausf E** were introduced, with new torsion-bar suspensison which gave them a much increased road speed of 55 km/h (34 mph), although cross-country speed was slower than that of the earlier models. The final production model of the series was the **PzKpfw II Ausf F**, which appeared in 1940-1 and which was uparmoured to 35 mm (1.38 in) on the front and 20 mm (0.79 in) on the sides, this pushing up the total weight to just under 10 tonnes and consequently reducing the speed of the vehicle, which was felt to be acceptable because of the greater protection provided.

The hull and turret of the PzKpfw II was of welded steel construction, with the driver at the front, two-man turret in the centre offset to the left, and the engine at the rear. Armament consisted of a 20-mm cannon (for which 180 rounds were provided) on the left side of the turret, and a 7.92-mm (0.31-in) machine-gun (for which 1,425 rounds were carried) on the right of the turret.

The PzKpfw II was also used as the basis for a number of fast reconnaissance tanks called the **Luchs** (this name was subsequently adopted by the new West German Army in the 1970s for its 8×8 reconnaissance vehicle) but these and similar vehicles were not built in large numbers.

One of the more interesting vehicles was the special amphibious model developed for the invasion of England in 1940. This model was propelled in the water at a speed of 10 km/h (6 mph) by a propeller run off the main engine. A model with two flamethrowers was also produced as the **Flammpanzer II**; 100 of these were in service by 1942.

When the basic tank was obsolete the chassis was quickly adopted for many other roles. One of the first of these was a self-propelled anti-tank gun using captured Soviet 76.2-mm (3-in) guns and called the **Marder I**. This was followed by a model called the **Marder II** with a 7.5-cm (2.95-in) German anti-tank gun, and some 1,200 of these were converted or built. The **Wespe** was a self-propelled gun fitted with a 10.5-cm howitzer and was produced in Poland until 1944.

Specification

PzKpfw II Ausf F

Crew: 3

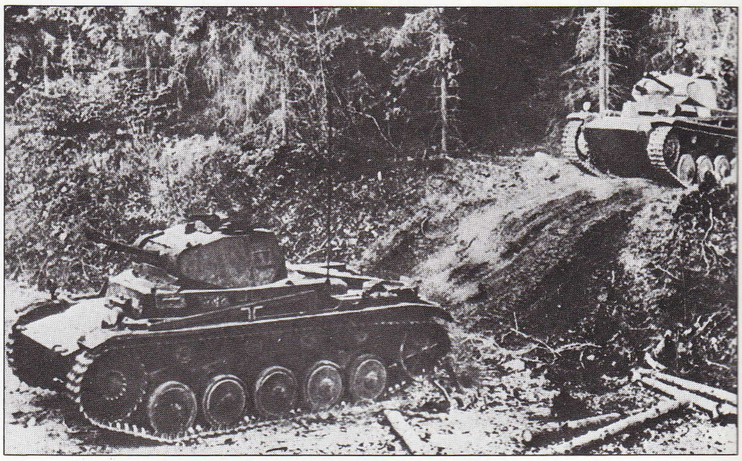
Weight: 10000 kg (22,046 lb)

Dimensions: length 4.64 m (15 ft 3 in); width 2.30 m (7 ft 6.5 in); height 2.02 m (6 ft 7.5 in)

Powerplant: one Maybach six-cylinder petrol engine developing 140 hp (104 kW)

Performance: maximum road speed 55 km/h (34 mph); maximum road range 200 km (125 miles); fording 0.85 m (2 ft 10 in); gradient 50 per cent; vertical obstacle 0.42 m (1 ft 5 in); trench 1.75 m (5 ft 9 in)

Armed with a 20-mm cannon, some 1000 PzKpfw IIs were used during the Polish campaign.



GERMANY

Panzerkampfwagen III medium tank

It was envisaged in the mid-1930s that each German tank battalion would have three companies of relatively light medium tanks and one company of better armed and armoured medium tanks. The former eventually became the **Panzerkampfwagen III (PzkPfw III)** or **SdKfz 141**, while the latter became the Panzerkampfwagen IV (PzKpfw IV) which was to remain in production throughout World War II. In 1935 the Weapons Department issued contracts for the construction of prototype vehicles against the lighter concept to Daimler-Benz, Krupp, MAN and Rheinmetall-Borsig. At an early stage it was decided to arm the tank with a 37-mm gun which would fire the same ammunition as that used by the infantry anti-tank gun, but provision was made that the turret ring diameter be large enough to permit the upgunning of the vehicle to 50 mm if this should be required. Following trials with the prototype vehicles the Daimler-Benz model was selected, although the first three production models, the **PzKpfw III Ausf A, PzKpfw III Ausf B** and **PzKpfw III Ausf C** were built only in small numbers, differing from each other mainly in suspension details. In September 1939 the vehicle was formally adopted for service, and mass production was soon under way. The

Continued on page 508

A Panzer III with accompanying infantry during 1942. By this time the German tanks had come up against the excellent Soviet T-34, and armour and armament were being increased.

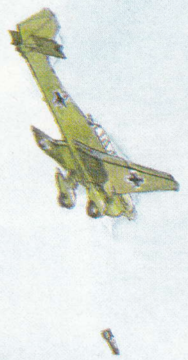
Blitzkrieg!

Blitzkrieg did not appear out of nowhere to paralyze the armies of Poland and the West. Its origins lay in the last years of World War I and in the writings of lonely military voices between the wars.

The type of warfare that has now passed into history as the *Blitzkrieg* had a relatively short life of only a few years (from 1939 to 1942), but during those years its impact and effects produced nothing short of a military and historical revolution. By a series of rapid and sharp campaigns the German army was able to demonstrate to the whole world that it was master of a new form of warfare that enabled it to overcome the carnage and costs of the static warfare of the 1914-18 period, and to humble enemy after enemy at minimum cost to the German nation and a maximum cost to its opponents.

First prophets

After 1918 most armies relegated tanks to the infantry-support role, but a few prophets had by then appreciated the potential of the tank in future warfare. One of these was a Captain Basil Liddell Hart, and other far-sighted individuals were Generals Fuller, Martel, Broad and Lindsay, who joined Liddell Hart in advocating the establishment of an armoured force for use in future wars. By dint of influence, persuasion and the use of a series of essays and books, they managed to establish a British 'Experimental Mechanised Force' by the late 1920s, but this advanced experiment was unable to survive long in a period of financial austerity and was soon disbanded. But the point was well taken elsewhere, especially in Germany where Liddell Hart's theories regarding a balanced armoured force were examined in great detail by several military theorists, one of whom was the future General Heinz Guderian. He followed Liddell Hart's thinking in that any future armoured force had to be a balance of tanks, artillery, pioneers and mechanized infantry rather than follow the then-current thought that an all-tank force would rule the field.



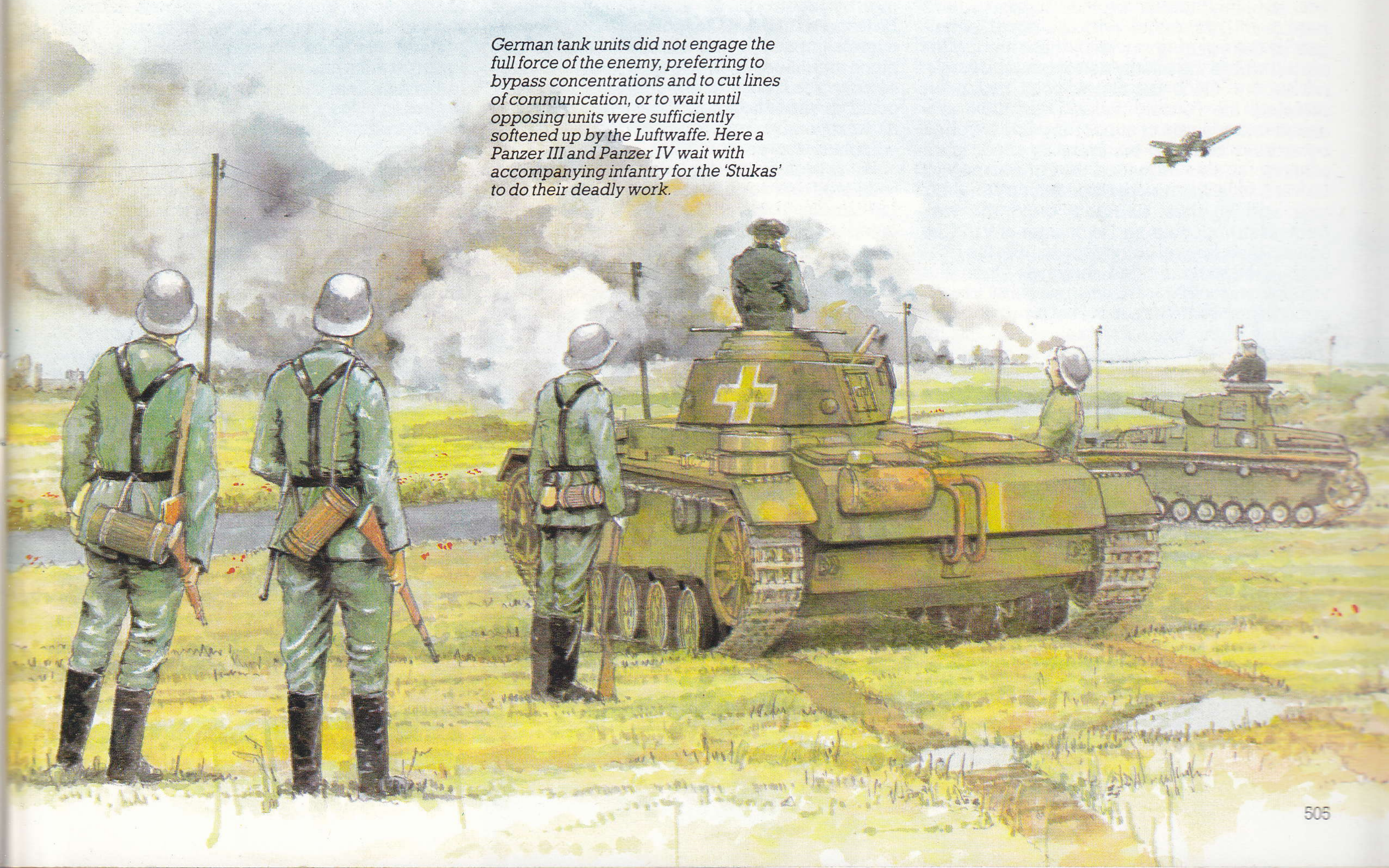
Dive-bombers played their part in* Blitzkrieg*, acting as extremely mobile artillery in advance of the armoured columns and softening up any resistance.

As is now well known, Liddell Hart and Guderian emerged as the correct theorists. What they proposed was a balanced force whose main striking force was formed by a mobile spearhead of tanks, mechanized infantry and artillery. But whereas Liddell Hart was forced to spend his time preaching to an unhearing audience Guderian was able to put some of his ideas into practice as the first post-war German tank formations were formed in 1934. In a manual written soon afterwards, the function of the new German Panzer arm was defined as the creation of 'rapid concentrations of considerable fighting power, obtaining quick decisions by breakthroughs, deep penetration on wide fronts and the destruction of the enemy'. This policy was being advocated at a time when other armies were still forcing their armour to move at the pace of the marching soldier. The Germans simply increased the speed of their spearhead infantry, initially by carrying them on trucks and later by mounting them in specialized halftracks.

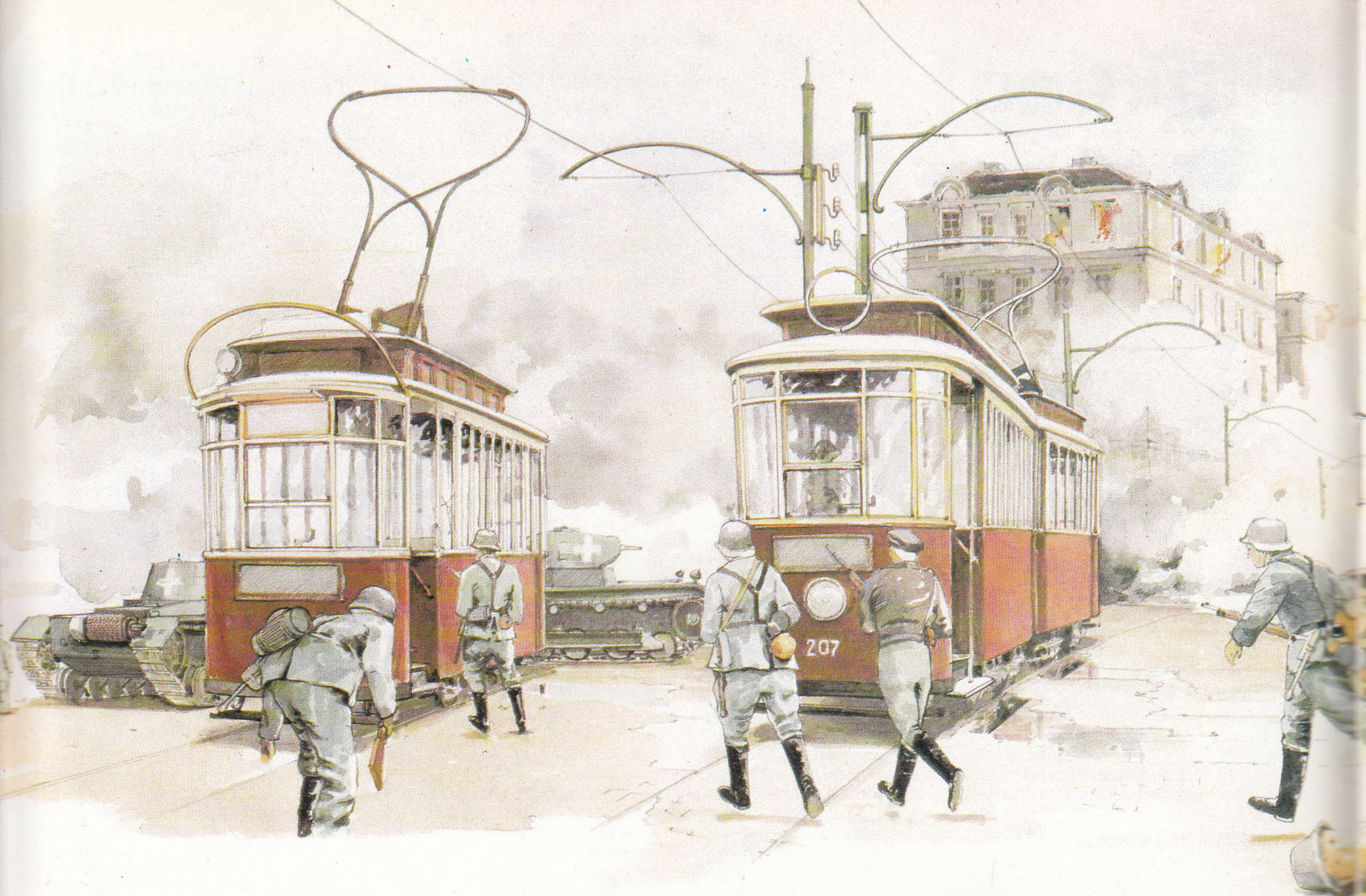
The German Panzer arm did not have things all its own way in the years up to 1939, for many conservatives in the German army still adhered to the well-established techniques and disciplines of their forebears, but the Panzer troops gradually trained and equipped for their new role. Although the tanks were to be the spearhead, the first German tanks were little more than training and familiarization machines. They were small, and lightly armed and armoured, and had definite tactical limitations; production of better designs was slow and expensive. These limitations were simply overcome by the emergence of what can be described as a German genius in adapting to the requirements of mechanized warfare, and by the motivation of the nationalistic creed of Hitler, who encouraged the efforts of the Panzer troops at every stage. When this was combined with the balanced outlook of leaders like Guderian, the result was a novel weapon of war that was to shock the world.

Theory

Blitzkrieg is simple enough to describe. Using the newly-formed Panzer divisions the German army was able to form an overwhelming offensive spearhead at a pre-selected point or points on a battlefront. This point was carefully chosen when possible by the use of reconnaissance troops mounted, no longer on horses



German tank units did not engage the full force of the enemy, preferring to bypass concentrations and to cut lines of communication, or to wait until opposing units were sufficiently softened up by the Luftwaffe. Here a Panzer III and Panzer IV wait with accompanying infantry for the 'Stukas' to do their deadly work.



as was the rule before 1918, but on motorcycles with armoured cars to provide support where required. Using radio, in itself a novel technique in the years up to 1940, these troops reported where the enemy's strengths and weaknesses lay. Once the attack point had been selected, the Panzers massed and then advanced under a rain of supporting fire supplied by artillery and dive-bombers. By sheer force of impact and shock tactics, the Panzers moved forward with the mechanized infantry in their rear and on their flanks to clear the way through strongpoints and to counter any moves against their lines of communication as the phalanx of Panzers moved forward. Once the armour was clear of the immediate breakthrough point, further support was provided by the guns of the tanks themselves and the innovatory use of dive-bombers to crush any opposing strongpoints. Assault pioneers travelled with the tanks and mechanized infantry, and all the time the tanks thrust deep and then fanned out in all directions.

It was at this point that the full impact of the new *Blitzkrieg* was felt, for the mobility and firepower of the tanks enabled them to range far and wide in the enemy's rear areas to disrupt communications, interrupt supplies, create havoc and generally destroy the ability of the enemy to fight an organized battle. With the enemy unable to respond or to make meaningful countermoves, the Panzers were then free to advance over hitherto impossible distances and towards distant objectives within periods of days rather than the months of previous campaigns. As they moved the tanks retained the support of the mechanized infantry, and the early absence of mobile artillery was overcome by the continued use of dive-bombers and other airborne support. If airborne landings by paratroops or gliderborne units could be used as well, so much the better, for the overall impact on the enemy would be that much amplified. As the deep advances into the enemy rear continued, marching infantry could assume the roles of guarding the flanks and preventing counterthrusts on the lines of communication.

Put in such simple terms, the art of *Blitzkrieg* sounds all too easy. But in reality it was anything but simple. It called for a very high level of co-operation, not only between the constituent arms but also between the army and the air force (the Luftwaffe), for in the absence of self-propelled artillery the Junkers Ju 87 Stukas had to be used. This called for a degree of inter-service co-operation unknown in many other nations, but by 1939 the Germans had been able to train and practise such tactics to the point where they were almost routine. By 1939 they had even been tried out in what can now be seen as dress rehearsals. The first of these was the bloodless invasion of Austria (1938), soon followed by the equally bloodless occupation of the Sudetenland (1938) and the rest of Czechoslovakia (1939). Such operations revealed many shortcomings in German organization and equipment, but these had been ironed out by the time *Blitzkrieg* became a reality in September 1939.

Poland

The *Blitzkrieg* campaign against Poland in 1939 now reads like a textbook operation. The Poles put up a gallant fight while they could, but the *Blitzkrieg* tactics enabled the Germans to strike hard and deep and it was all over in a matter of weeks. This campaign also demonstrated to the Germans some more of their own shortcomings, for the majority of the tanks used were still PzKpfw Is and IIs, little more than training machines. These had been eked out by large infusions of Czech tanks which proved to be excellent except for their lack of heavy armament. The shortage of mechanized infantry was often felt, and while artillery support was usually provided when called for the vast bulk of the equipment available was still horse-towed and too slow to follow up the rapid advances of the Panzers.

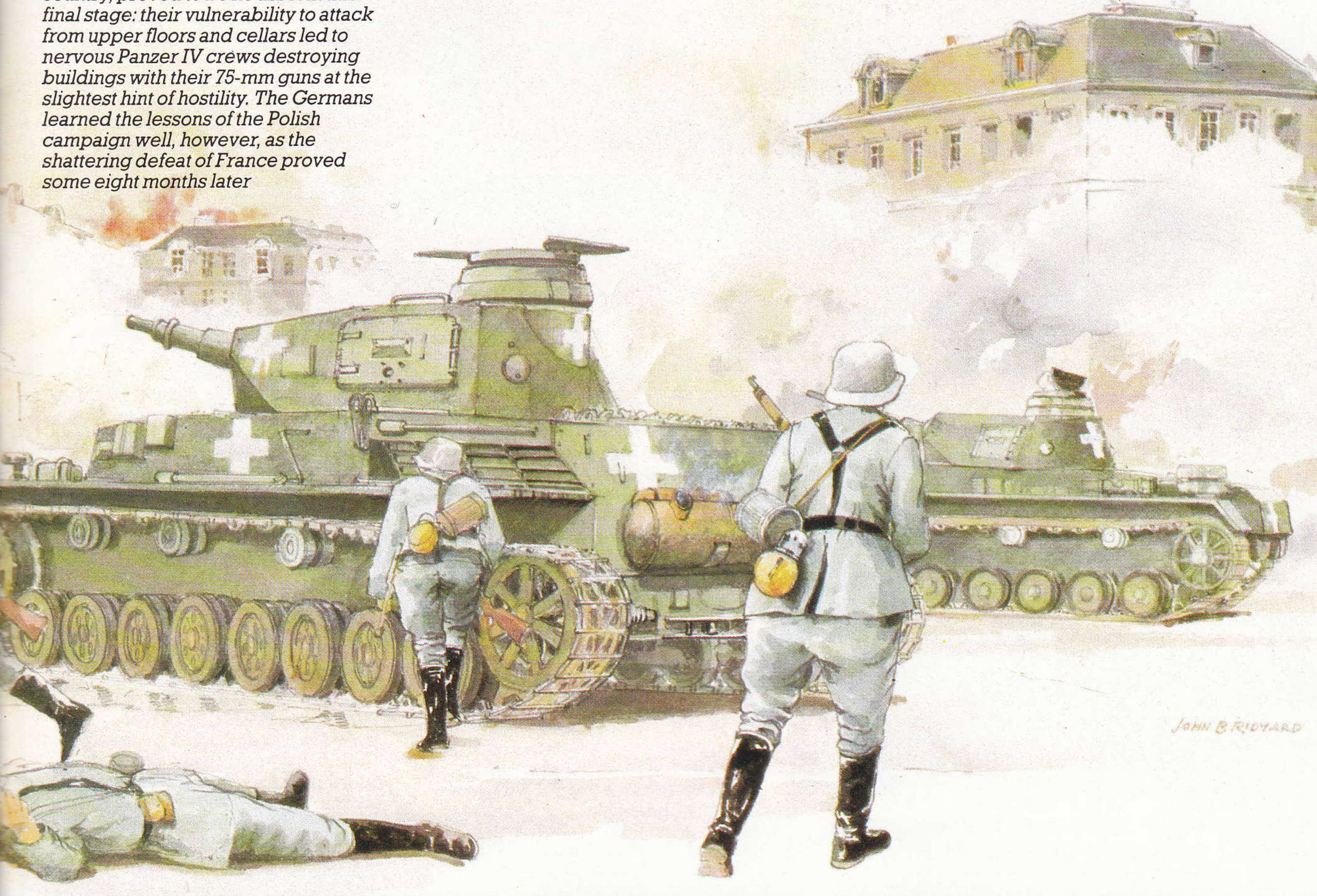
The West

After a short period of German regrouping and re-equipment, and further training and expansion, the next nation to feel the force of *Blitzkrieg* was France. In the campaign that lasted from May to June 1940, Germany's ancient enemy was humbled and defeated as no nation had been defeated for centuries, and the credit for this must go to the *Blitzkrieg* tactics. After an unexpected attack through the Ardennes, the Panzers fell on the static French units around Sedan, scattered them, captured mounds of equipment and then rushed to the Channel coast. Leaving aside all the conventional military approaches to warfare the Panzers struck deep through France and in a series of rapid moves defeated the Belgians, the French and finally the British forces. The occupation of France followed, the BEF was sent packing from the Dunkirk beaches and preparations were made to attack the United Kingdom.

The USSR

The next major demonstration of the power of *Blitzkrieg* was to come in 1941. Before that

The first spectacular campaign in the Blitzkrieg style came to a triumphant conclusion in the city of Warsaw. The Panzers, so devastating in open country, proved to be no asset in this final stage: their vulnerability to attack from upper floors and cellars led to nervous Panzer IV crews destroying buildings with their 75-mm guns at the slightest hint of hostility. The Germans learned the lessons of the Polish campaign well, however, as the shattering defeat of France proved some eight months later



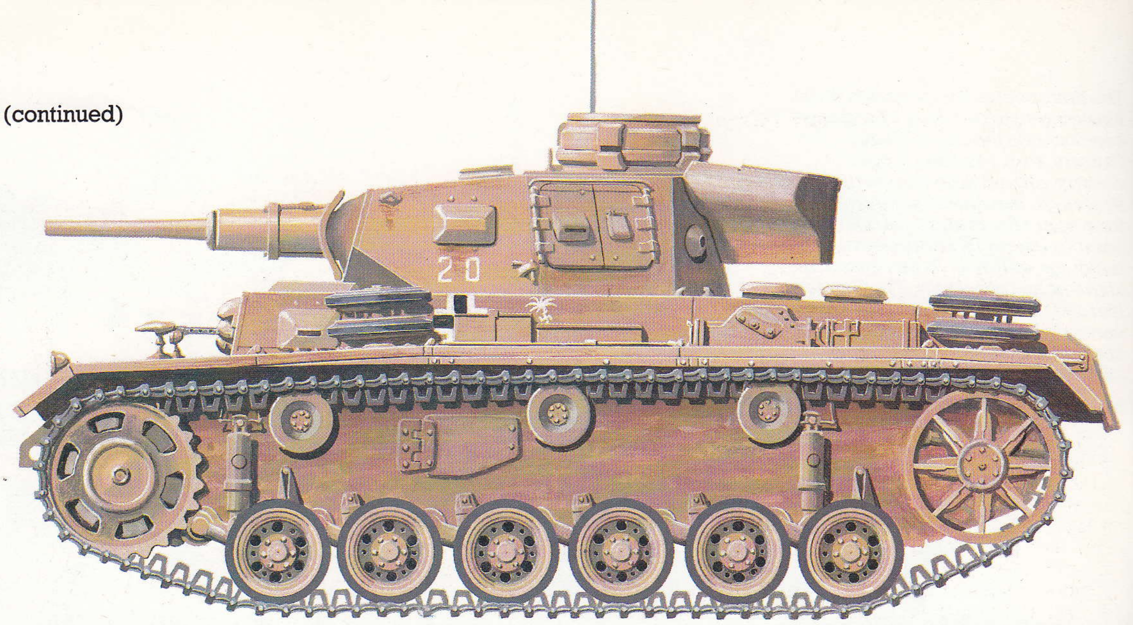
small demonstrations were laid on in the Balkans and Greece, and the early stages of the North African campaigns once more demonstrated the use of the new armoured warfare by the newly-arrived German Afrika Korps. These desert campaigns revealed that the *Blitzkrieg* methods would work only as long as the forces involved could keep moving. Once they came to a halt, either intentionally or under the influence of strictures such as lack of supplies (usually fuel) or enemy action, their effectiveness was negated to a marked degree. As soon as they came to a halt 'conventional' methods once more came into play and the whole *Blitzkrieg* cycle had to be re-established, not always under favourable circumstances.

This fact was underlined in 1941 when the German army finally over-reached its abilities with the advance into the Soviet Union. Operation 'Barbarossa' at first had fantastic successes as the Panzers moved deep and wide into the USSR, capturing whole armies and cities along with the equipment and supplies to maintain armies in the field for years. But despite all these successes the sheer size of the Russian landscape swallowed up all the advances and the limited capacity of the Germans to maintain their momentum. Gradually the distances involved overcame the German advances, the terrain took a fearful toll of tanks and weapons, and by the end of 1941 the Russian winter had brought an end to the forward momentum.

The better weather in the spring of 1942 again set the power of the Panzer units into action and they rolled forward once more. Great advances and victories were achieved, but it was all for nothing. By the end of the year an entire German army was embroiled in Stalingrad, the desert advances in North Africa had been brought to a halt and Germany was finally feeling the strain of attempting to maintain the initiative. The end of 1942 was the end of the *Blitzkrieg* era.

After 1942 balanced armoured formations continued to be the norm but the heady successes of the *Blitzkrieg* era were rarely repeated. Counters to the breakthrough were soon established, but what was more important was that Germany's enemies themselves adopted the German tactics. Then they could take on the power of the Panzers on their own terms. They too were able to strike back with equal force and impact, and while the tank continued to form the main striking force on the battlefield it was never able to regain the overall dominance it achieved during 1939, 1940 and 1941. Thus an era in warfare passed, though its effects are with us still. Armies still move into battle in forces that are evenly balanced between tanks, mechanized infantry and artillery, with close support supplied by a rapidly-responding air arm. But the only way the huge advances of the *Blitzkrieg* era will be repeated is when one side has an overwhelming preponderance in numbers and weapon power. Today that situation can be prevented by the use of nuclear weapons.

Triumphant Panzer troops advance through a Soviet town. The summer of 1941 was the high point for* Blitzkrieg*, but the Germans were soon to come up against the USSR's oldest ally – winter.



PzKpfw Ausf G, as used by the Afrika Korps. Tropicalized, and with a 50-mm gun, the German tank proved effective against the lighter British tanks, and was much more mobile than the heavy infantry tanks.

PzKpfw III was first used in combat during the invasion of Poland. The next production models were the **PzKpfw III Ausf D** and **PzKpfw III Ausf F**, the former with thicker armour and a revised cupola, and the latter with an uprated engine and only six road wheels. In 1939 it was decided to push ahead with the 50-mm model and this entered production in 1940 under the designation **PzKpfw III Ausf F**. This was followed by the **PzKpfw III Ausf G** version with similar armament but more powerful engine. For operations in North Africa the vehicles were fitted with a tropical kit, while for the proposed invasion of England a special version for deep wading was developed. The latter were never used for their intended role but some were successfully used during the invasion of the USSR in 1941. The **PzKpfw Aus H** introduced wider tracks and a number of important improvements.

The 50-mm L/42 gun was inadequate to cope with the Soviet T-34 tank, so the longer-barrelled KwK 39 L/60 weapon was installed. This had a higher muzzle velocity, and vehicles fitted with the weapon were designated **PzKpfw III Ausf J**. Many vehicles were retrofitted with the 50-mm gun, and by early 1942 the 37-mm version had almost disappeared from front-line service. The next model was the **PzKpfw III Ausf L**, which had greater armour protection, pushing its weight up to just over 22 tonnes, almost 50 per cent more than the weight of the original prototype. The **PzKpfw III Ausf M** and **PzKpfw III Ausf N** were fitted with the 75-mm L/24 gun which had been installed in the PzKpfw IV; a total of 64 rounds of ammunition were carried for this gun. Production of the PzKpfw III was finally completed in August 1943. The chassis was also used as the basis for the 75-mm assault gun (**Gepanzerte Selbstahrlafette für Sturmgeschutz 7.5 cm Kanone** or **SdKfz 142**), of which a few were used in the invasion of France in 1941; production of improved SP guns on PzKpfw III chassis continued until the end of World War II. Other variants included an armoured recovery vehicle, an armoured observation vehicle (**Panzerbeobachtungswagen**) and a command vehicle (**Panzerbefehlswagen III**). A total of 15,000 chassis was produced for both the tank and assault gun applications.

The layout of the PzKpfw III was basically the same in all vehicles, with the driver at the front of the hull on the left and the machine-gunner/radio operator to his right. The three-man turret was in the centre of the hull, the commander having a cupola in the centre of the roof at the rear. The engine was at the rear of the hull, and the suspension, which was of the torsion-bar type from the PzKpfw III Ausf E, consisted on each side of six small road wheels, with the drive sprocket at the front and the idler at the rear; there were three track-return rollers.

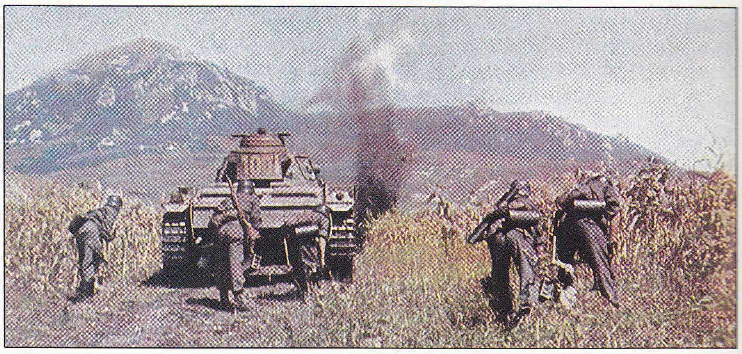
Specification
PzKpfw III Ausf M
Crew: 5
Weight: 22300 kg (49,160 lb)

Dimensions: length (including armament) 6.41 m (21 ft 0 in);length (hull) 5.52 m (18 ft 1.5 in); width 2.95 m (9 ft 8 in); height 2.50 m (8 ft 2.5 in)
Powerplant: one Maybach HL 120 TRM 12-cylinder petrol engine developing 300 hp (224 kW)
Performance: maximum road speed 40 km/h (25 mph); maximum road range 175 km (110 miles); fording 0.8 m (2 ft 8 in); gradient 60 per cent; vertical obstacle 0.6 m (2 ft 0 in); trench 2.59 m (8 ft 6 in)

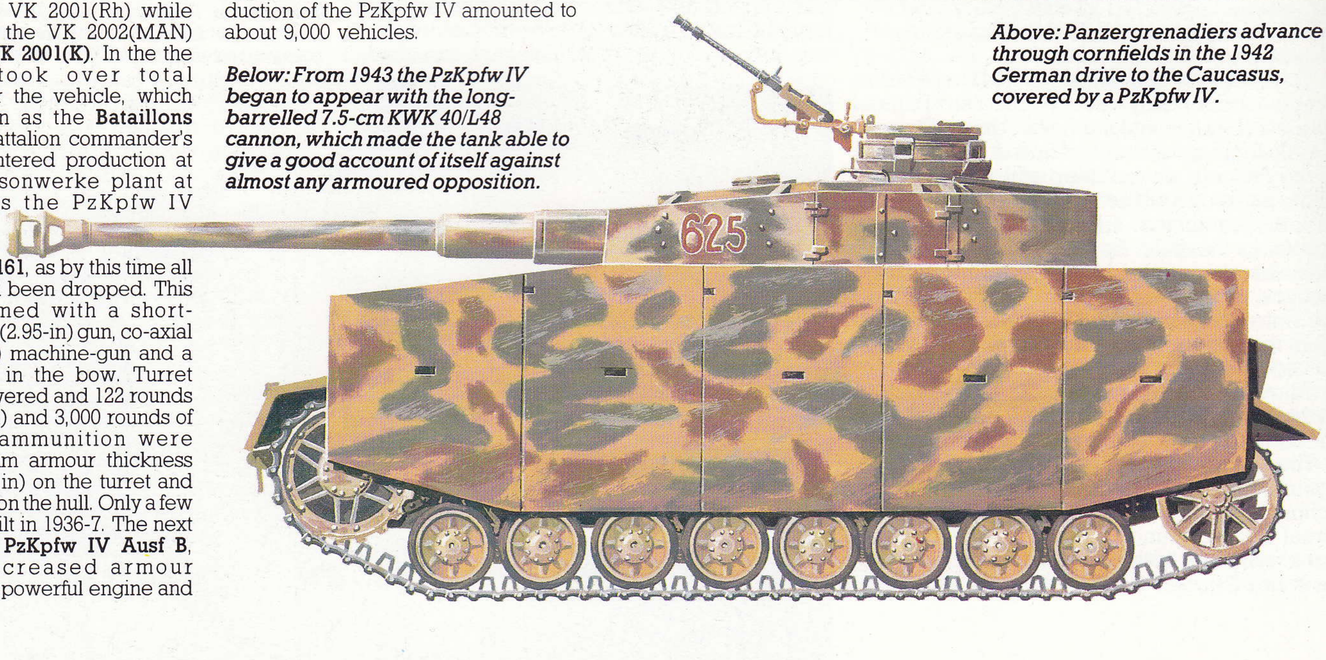
GERMANY

Panzerkampfwagen IV medium tank

The **Panzerkampfwagen IV** had the distinction of remaining in production throughout World War II, and formed the backbone of the German armoured divisions. In 1934 the Army Weapons Department drew up a requirement for a vehicle under the cover name of the medium tractor (**mitteren Traktor**) which was to equip the fourth tank company of each German tank battalion. Rheinmetall-Borsig built the VK 2001(Rh) while MAN produced the VK 2002(MAN) and Krupp the **VK 2001(K)**. In the the end Krupp took over total responsibility for the vehicle, which was also known as the **Bataillons Führerwagen** (battalion commander's vehicle). This entered production at the Krupp-Grusonwerke plant at Magdeburg as the PzKpfw IV Ausf A, or **SdKfz 161**, as by this time all cover names had been dropped. This model was armed with a short-barrelled 75-mm (2.95-in) gun, co-axial 7.92-mm (0.31-in) machine-gun and a similar weapon in the bow. Turret traverse was powered and 122 rounds of 75-mm (2.95-in) and 3,000 rounds of machine-gun ammunition were carried. Maximum armour thickness was 20 mm (0.79 in) on the turret and 14.5 mm (0.57 in) on the hull. Only a few of these were built in 1936-7. The next model was the **PzKpfw IV Ausf B**, which had increased armour protection, more powerful engine and other more minor improvements. Throughout the PzKpfw IV's long production life the basic chassis remained unchanged, but as the threat by enemy anti-tank weapons increased so more armour was added and new weapons were installed. (Other chassis often had to be phased out of production as they were incapable of being upgraded to take into account changes on the battlefield.) The final production model was the **PzKpfw IV Ausf J**, which appeared in March 1944. Total production of the PzKpfw IV amounted to about 9,000 vehicles.



Above: Panzergrenadiers advance through cornfields in the 1942 German drive to the Caucasus, covered by a PzKpfw IV.



Below: From 1943 the PzKpfw IV began to appear with the long-barrelled 7.5-cm KWK 40/L48 cannon, which made the tank able to give a good account of itself against almost any armoured opposition.

The chassis of the PzKpfw IV was also used for other, more specialized vehicles including the **Jagdpanzer IV** tank destroyer, self-propelled anti-aircraft gun systems of various types (including one with four 20-mm cannon and another with one 37-mm cannon), self-propelled guns, armoured recovery vehicles and bridgelayers to name but a few.

A typical PzKpfw IV was the **PzKpfw IV Ausf F2**, which had a hull and turret of all-welded steel armour construction, the former having a maximum thickness of 60 mm (2.36 in) and the latter of 50 mm (1.47 in). The driver was seated at the front of the hull on the left, with the bow machine-gunner/radio operator to his right. The commander, gunner and loader were seated in the turret in the centre of the hull, with an entrance hatch on each side of the turret and a cupola for the tank commander. The engine was at the rear of the hull and coupled to a manual transmission with six forward and one reverse gears. Main armament comprised a long barrelled 75-mm (2.95-in) KwK gun fitted with a muzzle brake and which could fire a variety of ammunition including HEAT, smoke, APCR, APCBC and high explosive, the last being used in the infantry support role. A 7.92-mm (0.31-in) MG34 machine-gun was mounted co-axial with and to the right of the main armament, while a similar weapon was mounted in the bow. Totals of 87 rounds of 75-mm (2.95-in) and 3,192 rounds of 7.92-mm (0.31-in) machine-gun ammunition were carried. Turret traverse was powered through 360°, though manual controls were provided for emergency use.

The additional armour and heavier armament pushed up the weight until in the final production version it reached 25 tonnes, but the PzKpfw IV still had a respectable power-to-weight ratio and therefore good mobility characteristics.

Specification

PzKpfw IV Ausf H

Crew: 5

Weight: 25000 kg (55,115 lb)

Dimensions: length (including armament) 7.02 m (23 ft 0 in); length (hull) 5.89 m (19 ft 4 in); width 3.29 m (10 ft 9.5 in); height 2.68 m (8 ft 9.5 in)

Powerplant: one Maybach HL 120 TRM 12-cylinder petrol engine developing 300 hp (224 kW)

Performance: maximum road speed 38 km/h (24 mph); maximum road range 200 km (125 miles); fording 1.0 m (3 ft 3 in); gradient 60 per cent; vertical obstacle 0.6 m (2 ft 0 in); trench 2.20 m (7 ft 3 in)

A PzKpfw IV is serviced in the field in the USSR. Visible is the short-barrelled 75-mm gun; this was soon found to be inadequate against Soviet tanks, and had to be replaced by a longer, higher-velocity gun.

Panther in Action

Introduced prematurely to action during the great tank battles around Kursk in 1943, the PzKpfw V Panther was to become one of the finest fighting vehicles of World War II.

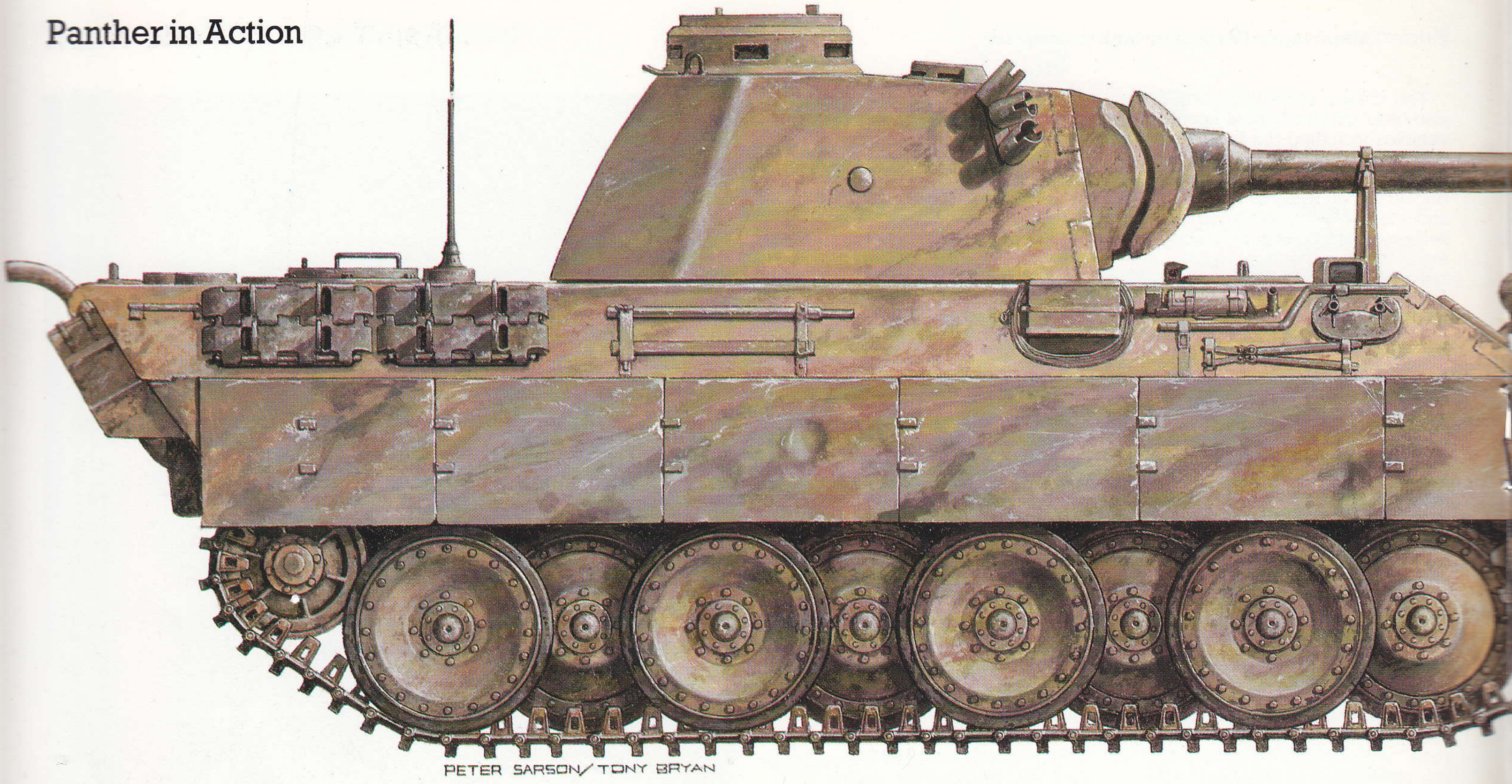
The main Allied tank, the Sherman, passes a captured Panther in the Ardennes. It often took up to five Shermans to knock out a single Panther, usually at the cost of some of the Allied tanks.

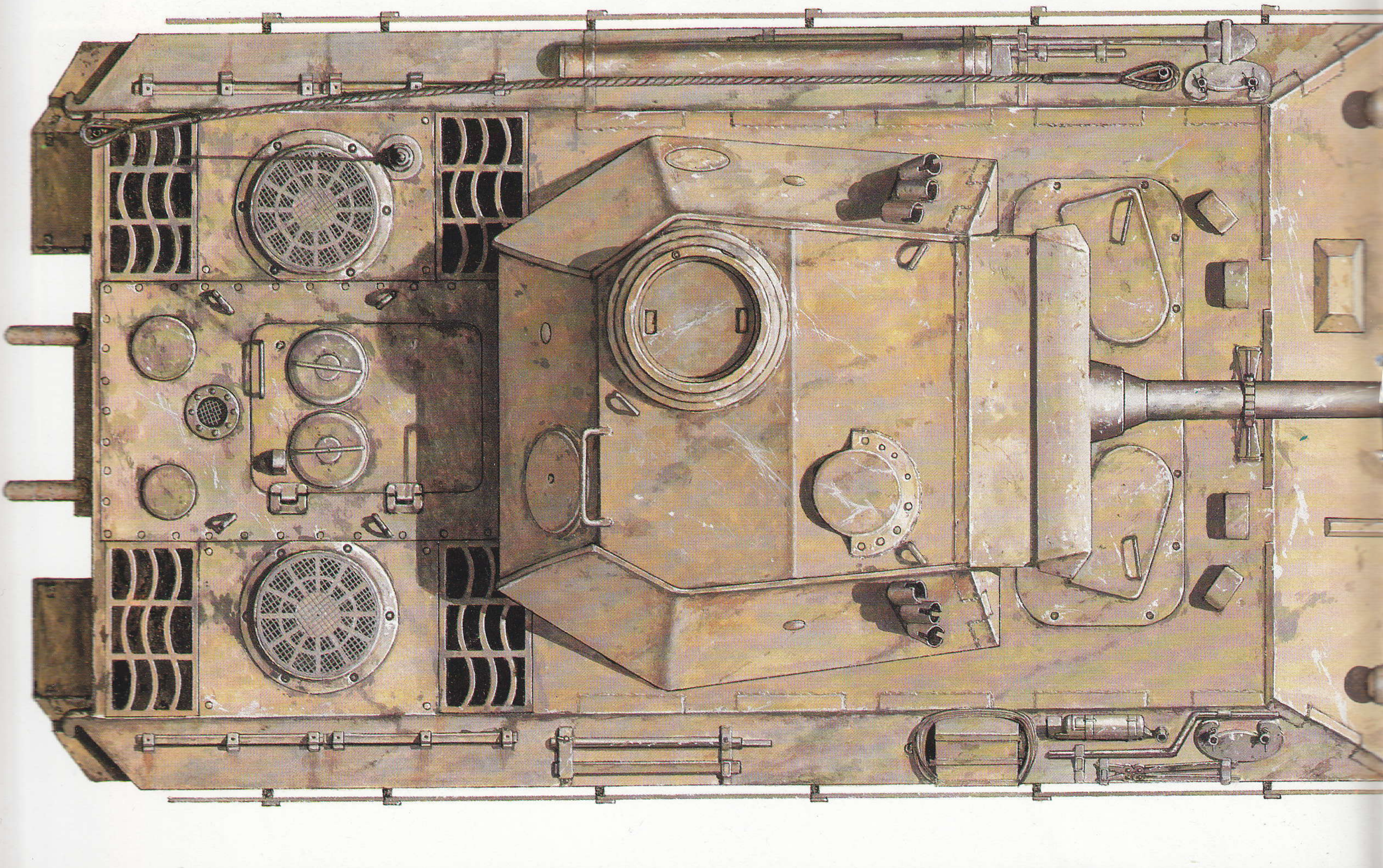
The first major engagement in which the Panther was involved was the massive battle known as Operation 'Citadel', which was launched by the Germans against the Kursk salient on the Eastern Front in July 1943. It would be fair to say that much was expected of the Panther at this stage of the war, for at the beginning of 1943 the Germans had lost the Battle of Stalingrad and with it the vital strategic initiative, so Hitler had to find something that would restore his ascendancy and in the Panther tank he thought he had that something. He even went so far as to delay the start of the operation until the brand new Panthers, virtually straight from the factory production lines, were ready for action, but the delay brought disaster.

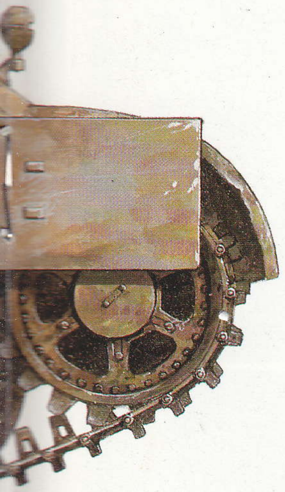
For a start, the Red Army was ready for the Germans. It had ample time to prepare in depth for the attack, and knew exactly where and how the Germans were to attack. When the Panthers and the equally new Elefants rolled forwards they moved into a storm of artillery and anti-tank gunfire and were soon floundering in a maze of entrenchments and minefields. Not surprisingly, the new German AFVs achieved but little. The attacks achieved little penetration, and the massive attempts to cut off the Kursk salient from the north and south were brought to an abrupt and expensive halt.

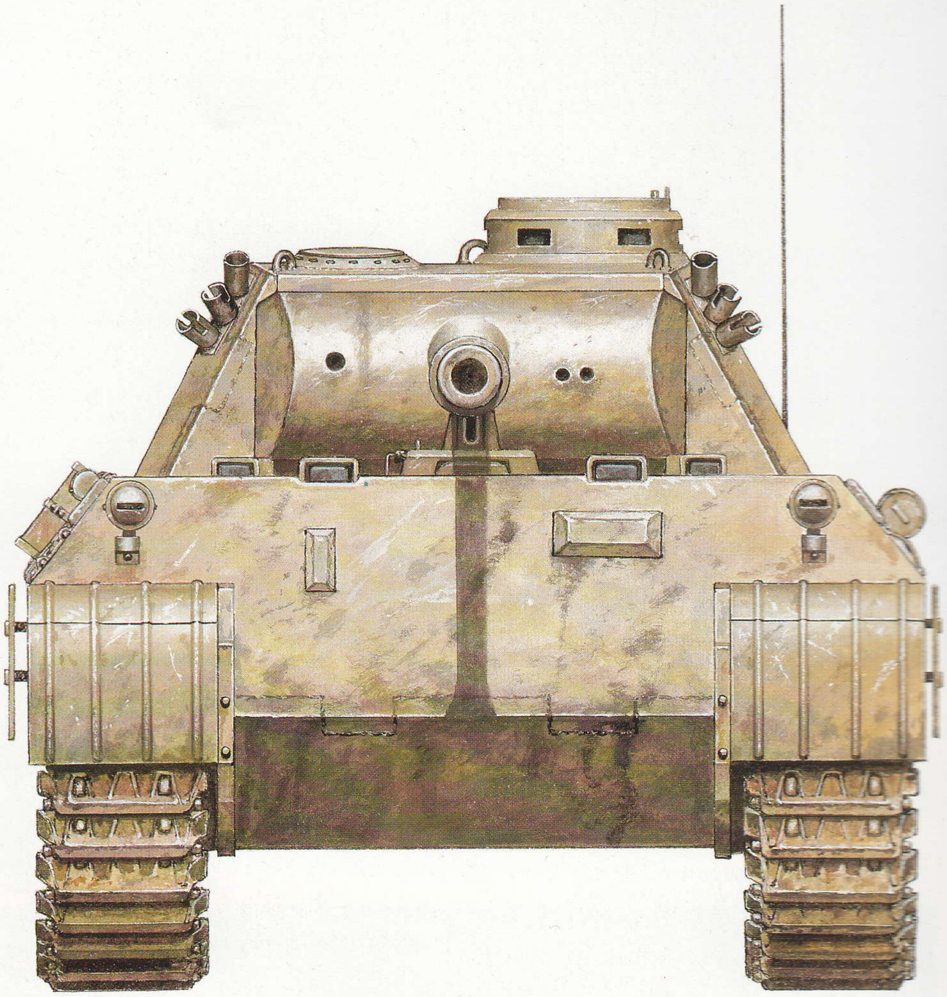
The Panthers did not do well. They were still underdeveloped, retaining too many of the mechanical and other faults that there had not been time to cure before the battle. The Panzer crews were unfamiliar with their new charges and were unable to get from them the degree of efficiency that later crews were able to attain. Many Panthers simply broke down before they even joined the battle. Those that did take part in the fighting soon found that the armour was proof against most of the guns they were likely to encounter and that their 75-mm (2.95-in) main gun was able to tackle the Soviet T-34s with lethal efficiency. But too few were able to make any impression on the Soviet hordes and Operation 'Citadel' had to be marked down as yet another failure of German arms.

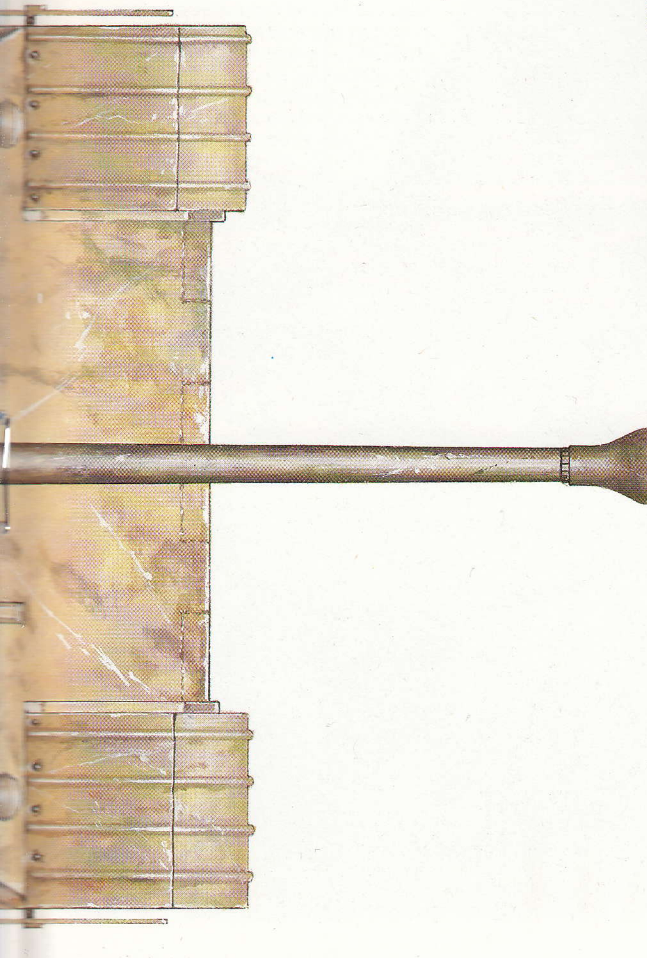
After Kursk the development of the Panther proceeded apace, and the vehicle was soon given the highest possible production priority. The early mechanical and other problems were gradually ironed out and the crews learned how to use the powerful instrument of war with which they had been provided. As a rule the new Panthers were issued to elite


PETER SARSON/TONY BRYAN









The introduction of the T-34 to the war on the Eastern Front showed that initiative in the field of tank design had passed to the Soviets. In order to regain the advantage, Germany needed new tanks, and the best of them became known as the Panther. With its thick, well-sloped armour and the long, high-velocity gun, the Panther was a match for almost any other tank.

Panther in Action

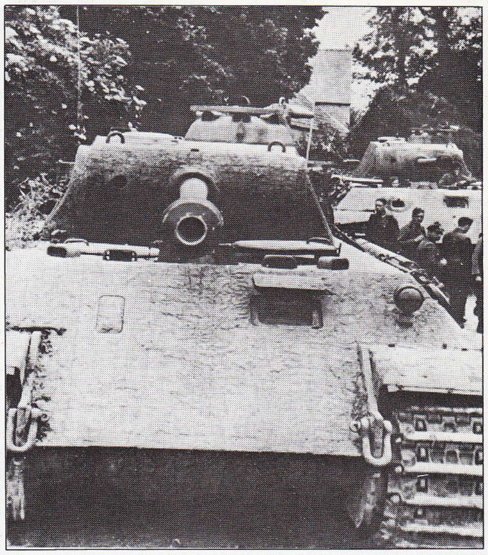
units, Waffen SS units being given priority over army units. Within these units were concentrated the most experienced officers and men the Panzer arm could produce. They were also provided with the best mechanics and fitters, for the Panther soon proved to be a complex beast requiring a great deal of maintenance to keep it running. All manner of problems were never entirely overcome. For instance, changing a wheel was a lengthy and difficult task yet it was one that had to be carried out quite often as the rubber rims wore away. The fire-control system was complex for its time, and required no end of bore-sighting and calibration. The gun itself required constant attention: it had to generate a high projectile velocity to penetrate its main opponent, the T-34, but as it was 70 calibres long high internal temperatures were produced and these rapidly produced barrel wear, demanding relatively frequent gun changes. The engine installation was another source of troubles, leading to all manner of modifications both in the field and on the production lines. Engine cooling was one long-term problem that was never entirely overcome, despite extensive changes to the exhaust system.

For all these problems, caused mainly by the rush with which the Panther was put into production, once in large-scale service the Panther proved to be a splendid fighting machine. The long 75-mm (2.95-in) gun proved to be capable of dealing with the T-34 and even the heavier IS-2 at long ranges, and at close range the 7.92-mm (0.31-in) machine-guns carried in the turret and the hull front could keep tank-killing infantry at bay. The protection provided by the large sheets of thick armour plating could deflect all but the heaviest armour-piercing projectiles, but even this was to little avail once the Allies started to use aircraft-launched rockets with armour-piercing heads, which could knock out even the heaviest Tiger.

Gradually the use of the Panther grew as more vehicles became available, and in theory at least the Panther was intended to replace the ubiquitous PzKpfw IV. The plan was that by late 1944 at least one *Abteilung* (battalion) in every three-*Abteilung* Panzer regiment would be equipped with Panthers (the other two would continue to use the PzKpfw IV). This *Abteilung* would have a headquarters company with at least eight Panthers, three of them being Befehlspanther vehicles with extensive radio installations. There were four companies in the *Abteilung*, each with a full strength of 17 Panthers, making a grand total of 76 Panthers to the full *Abteilung*.

In practice this was rarely if ever achieved. The factories simply could not turn out the numbers required, and once in action maintenance and other problems kept the available numbers well down. Battle attrition also contributed to the drain on numbers. There was also a drain upon basic numbers as a result of demand for specialized variants. The most important of these was the Jagdpanther, a superb tank destroyer that mounted a 88-mm (3.4-in) Pak 43 gun in a well-shaped fixed superstructure. Another variant was the Bergepanther recovery vehicle. Numbers of turrets were diverted towards the production of Panzerstellung, which were Panther turrets incorporated into fixed concrete installations used as part of inland or coastal defences.

At the end of the war the Panther was still in service and in demand. Post-war the type was used by the French army, and many of the features of the Panther design were incorporated in new designs. It was a superb main battle tank, but thankfully for the Allies it was never available in large numbers.

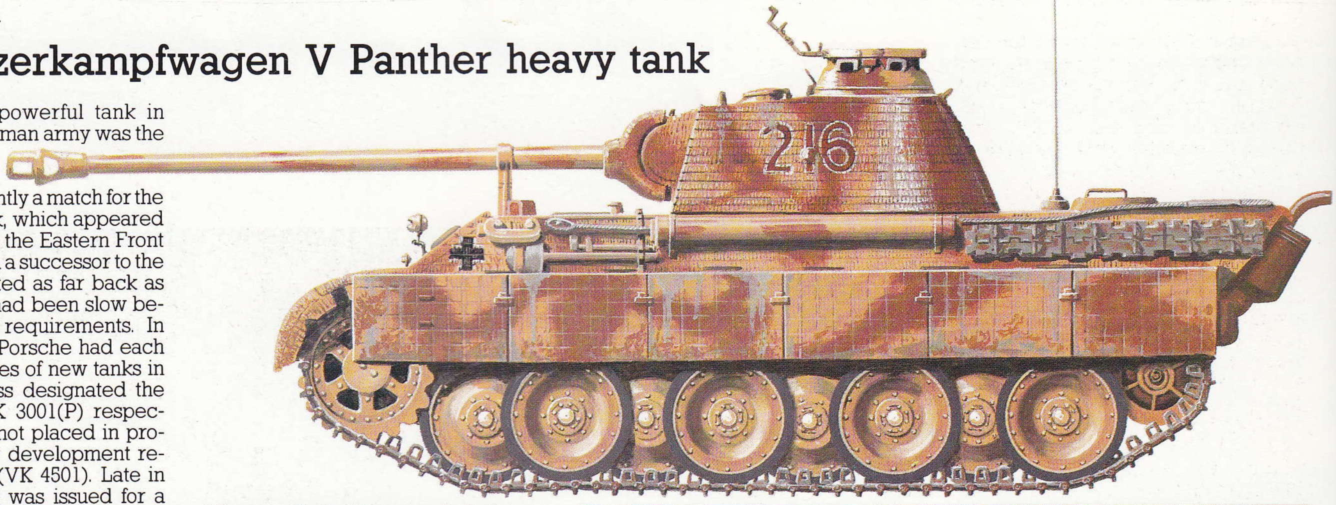


Panthers prepare to attack the Normandy landings. Such collections of vehicles proved tempting to the powerful Allied air forces, and the tanks suffered great losses while moving during the day.

GERMANY

Panzerkampfwagen V Panther heavy tank

In 1941 the most powerful tank in service with the German army was the PzKpfw IV, infrequently a match for the new Soviet T-34 tank, which appeared in small numbers on the Eastern Front in that year. Work on a successor to the PzKpfw IV had started as far back as 1937, but progress had been slow because of changing requirements. In 1941 Henschel and Porsche had each completed prototypes of new tanks in the 30/35-tonne class designated the VK 3001(H) and VK 3001(P) respectively. These were not placed in production, and further development resulted in the Tiger (VK 4501). Late in 1941 a requirement was issued for a new tank with a long barrelled 75-mm (2.95-in) gun, well-sloped armour for maximum protection within the weight limit of the vehicle, and larger wheels for improved mobility. To meet this requirement Daimler-Benz submitted the VK 3002(DB) while MAN submitted the **VK 3002(MAN)**. The former design was a virtual copy of the T-34 but the MAN design was accepted. The first prototypes of the new tank, called the **Panzerkampfwagen V Panther (SdKfz 171)** were completed in September 1942, with the first production models coming from the MAN factory just two months later. At the same time Daimler-Benz started tooling up for production of the Panther, and in 1943 Henschel and Niedersachen were also brought into the programme together with hundreds of sub-contractors. It



Above: PzKpfw V Panther in its late-war form. Skirts have been added to offer some protection to the wheels, and spare track has been used as auxiliary armour. The tank is covered in special anti-magnetic paste as a protection against magnetic mines.

Right: Probably the finest German tank of the war, the Panther was hampered by its complexity. Some 4,800 were built, as compared to 11,000-plus T-34/85s built by the Soviets in 1944 alone!

Panzerkampfwagen V heavy tank (continued)

was planned to produce 600 Panthers per month, but Allied bombing meant that maximum production ever achieved was about 330 vehicles per month. By early 1945 just over 4,800 Panthers had been built.

The Panther was rushed into production without proper trials, and numerous faults soon became apparent: indeed, in the type's early days more Panthers were lost to mechanical failure than to enemy action, and consequently the crew's confidence in the vehicle rapidly dwindled. The vehicle first saw action on the Eastern Front during July 1943 during the Kursk battles, and from then on it was used on all fronts. Once the mechanical problems had been overcome confidence in the tank soon built up again, and many consider the Panther to be the best all round German tank of World War II. In the immediate post-war period the French army used a number of Panther tanks until more modern tanks were available.

First production models were of the **PzKpfw V Ausf A** type, and were really pre-prodution vehicles; the **PzKpfw V Ausf B** and **PzKpfw Ausf C** were never placed in production. Later models were the **PzKpfw V Ausf D** followed for some reason by another PzKpfw V Ausf A, which was widely used in Normandy, and finally by the **PzKpfw V Ausf G.** Variants of the Panther included an observation post vehicle (**Beobachtungspanzer Panther**), ARV, **Jagdpanther** tank destroyer, and command vehicle (**Befehlspanzer Panther**), while some were disguised to resemble M10 tank detroyers during the Battle of the Bulge.

Main armament of the Panther was a long barrelled 75-mm (2.95-in) gun for which 79 rounds of ammunition were carried. Mounted co-axial with the main armament was a 7.92-mm (0.31-in) MG34 machine-gun, while a similar weapon was mounted in the hull front and another on the turret roof for anti-aircraft defence.

German armour, committed piecemeal, could not stop the Allied invasion of Europe. Here a Panther burns after being hit by British anti-tank weapons.

Specification

PzKpfw V Panther Ausf A

Crew: 4

Weight: 45500 kg (100,310 lb)

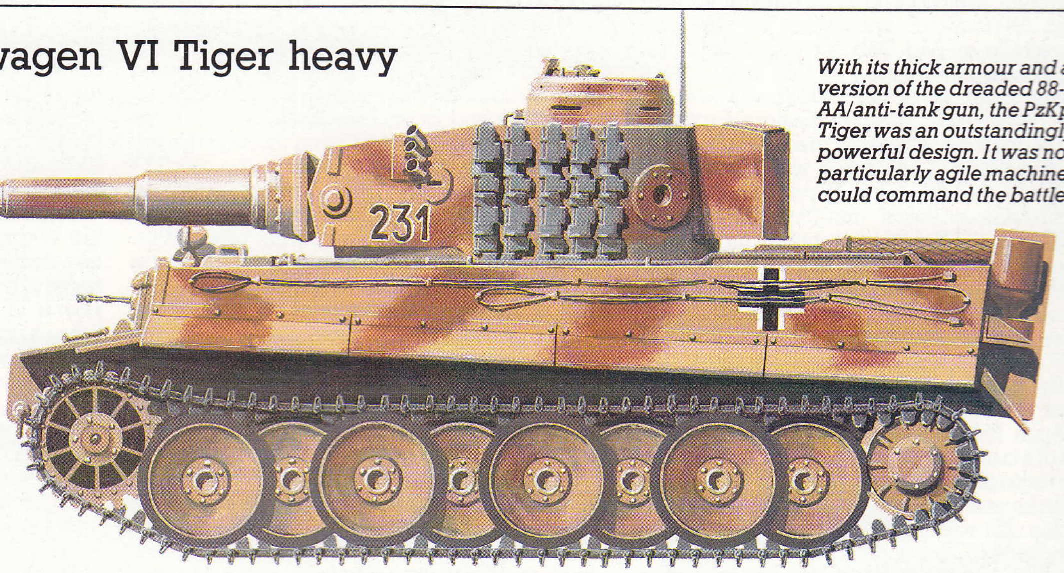
Dimensions: length (including armament) 8.86 m (29 ft 0.75 in); length (hull) 6.88 m (22 ft 7 in); width 3.43 m (11 ft 3 in); height 3.10 m (10 ft 2 in)

Powerplant: one Maybach HL 230 P 30 12-cylinder diesel engine developing 700 hp (522 kW)

Performance: maximum road speed 46 km/h (29 mph); maximum road range 177 km (110 miles); fording 1.70 m (5 ft 7 in); gradient 60 per cent; vertical obstacle 0.91 m (3 ft 0 in); trench 1.91 m (6 ft 3 in)

GERMANY

Panzerkampfwagen VI Tiger heavy tank



With its thick armour and a version of the dreaded 88-mm AA/anti-tank gun, the PzKpfw VI Tiger was an outstandingly powerful design. It was not a particularly agile machine, but could command the battlefield.

As far back as 1938 it has been realized that the PzKpfw IV tank would have to be replaced by a more modern design some time in the future. Various prototypes were built by a number of German companies, but none was placed in production. In 1941 an order was placed with Henschel for a 36-ton tank called the VK 3601 which was required to have a maximum speed of 40 km/h (25 mph), good armour protection and a powerful gun. A prototype of this tank was built but further work was stopped as an order was placed in May 1941 for a 45-ton tank called the VK 4501. This was to be armed with a tank version of the dreaded 88-mm (3.46-in) AA/anti-tank gun, which had then become the scourge of European armies. It was required that the prototype be ready for testing on Hitler's next birthday, 20 April 1942. As time was short Henschel incorporated ideas from the VK 3601 and another tank called the VK 3001(H). The end product was the **VK 4501(H)**, the letter suffix standing for Henschel. Porsche also went ahead with its own design and built the **VK 4501(Porsche)** to meet the same requirement. Both prototypes were completed in time to be demonstrated on Hitler's birthday, and the Henschel design was selected for production in August 1942 under the designation **PzKpfw VI Tiger Ausf E (SdKfz 181)**.

The Tiger was in production from August 1942 to August 1944, a total of 1,350 vehicles being built. It was then succeeded in production by the Tiger II or King Tiger for which there is a separate entry. In case trials proved the VK 4501(H) a failure, a batch of 90 VK 4501(P) tanks was ordered, and these were subsequently completed as 88-mm (3.46-in) tank destroyers under the designation **Panzerjäger Tiger (P) Ferdinand (SdKfz 184)**. The vehicle was named after its designer, Dr Ferdinand Porsche.

There were three variants of the Tiger, these being the Tiger command tank (**Befehlspanzer Tiger**) which was the basic gun tank with its main armament removed, but fitted with a winch but no crane, and the **Sturmtiger** which had a new superstructure fitted with a 38-cm (14.96-in) Type 61 rocket-launcher with limited traverse; only 10 of the last were built.

For its time the Tiger was an outstanding design with a powerful gun and good armour, but it was also too complicated and therefore difficult to produce. One of its major drawbacks was its overlapping wheel suspension which became clogged with mud and stones. On the Eastern Front this could be disastrous as during winter nights the mud froze and by the morning the tank had been immobilized, often at the exact time the Soviets would attack. When the vehicle travelled on roads a 51.5-cm (20.3-in) wide track was fitted, while a 71.5-cm (28.1-in) wide track was used for travel across country or in combat as this gave a lower ground pressure and so improved traction.

Main armament comprised an 88-mm (3.46-in) KwK 36 gun, with a 7.92-mm (0.31-in) MG 34 machine-gun co-axial with the main armament and a similar weapon ball-mounted in the hull front on the right. Totals of 84 rounds of 88-mm (3.46-in) and 5,850 rounds of machine-gun ammunition were carried.

The Tiger was first encountered in Tunisia by the British army and from then on appeared on all of the German fronts.

SS Tigers bivouac on the Brenner Pass, guarding the Italian border with Austria. By this time the Allies had landed in Italy and Mussolini had been overthrown.

Specification

PzKpfw VI Tiger Ausf E

Crew: 5

Weight: 55000 kg (121,250 lb)

Dimensions: length (including armament) 8.24 m (27 ft 0 in); length (hull) 6.20 m (20 ft 4 in); width 3.73 m (12 ft 3 in); height 2.86 m (9 ft 3.25 in)

Powerplant: one Maybach HL 230 P 45 12-cylinder petrol engine developing 700 hp (522 kW)

Performance: maximum road speed 38 km/h (24 mph); maximum range road 100 km (62 miles); fording 1.2 m (3 ft 11 in); gradient 60 per cent; vertical obstacle 0.79 m (2 ft 7 in); trench 1.8 m (5 ft 11 in)

Tiger Ace

Some of the tank men facing the Allies in Normandy were tough professionals, hardened by the bitter fighting on the Russian Front, and none was tougher than Michael Wittmann.

Michael Wittmann's ability and reputation increased over the same period as the German Panzer arm grew in power and size. He joined the German army in 1934 just as the first Panzer units were forming, but at first he served with an infantry unit. In 1937 he transferred to the Leibstandarte SS Adolf Hitler, and by 1939 was in command of an armoured car in Poland and France. By 1941 he had been transferred to a Geschutz III assault gun unit for service in the Balkans, still in the SS, and was then involved in the early advances into the Soviet Union. Here his abilities became evident, for even with an assault gun Wittmann was able to destroy Soviet tanks.

After two wounds and the award of an Iron Cross, Wittmann was sent to the SS-Junkerschule at Bad Tölz for officer training. With his new commission he took over one of the new Tiger 1s of the Leibstandarte's SS-Panzer Regiment 1. On the Eastern Front he was able to demonstrate his grasp of the tactical fundamentals of armoured warfare by destroying a formidable total of Soviet tanks. Using the firepower of the 88-mm (3.46-in) KwK 36, and overcoming the lack of mobility inherent in the bulk of the Tiger 1 by use of tactics and position, Wittmann had, by the beginning of 1944, notched up a total of no less than 117 'kills'. By that time he was the subject of the sort of public attention once bestowed on the Great War flying aces and had been awarded the highest decorations possible.

In April 1944 Wittmann was placed in command of a company of SS-Panzer Abteilung 101, a unit regarded as among the elite of the Panzer forces and still using the Tiger 1. In June 1944 this unit was not far from the area in Normandy where the 'Overlord' landings were made by the Allies, and the Tigers were ordered forward. They had to move from their base near Beauvais under the almost constant attentions of the Allied air forces and several Tigers were destroyed on the way. Damaged bridges and other obstacles prevented Wittmann's unit from reaching the battle area until 11 June, five days after the landings, and on 12 June the unit moved into position near the village of Villers-Bocage. On the following day Wittmann's unit moved forward into an action that was to become a legend in Panzer annals.

On 13 June the British 7th Armoured Division was moving towards Villers-Bocage in an attempt to take the area occupied by the German Panzer Lehr Division by a flank attack. By sheer chance Wittmann was perfectly placed directly in the path of the leading element of the 7th Armoured Division, the 22nd Armoured Brigade. Leading this brigade was the 3rd County of London Yeomanry (Sharpshooters), who had been given the task of securing the important crossroads in the centre of Villers-Bocage.

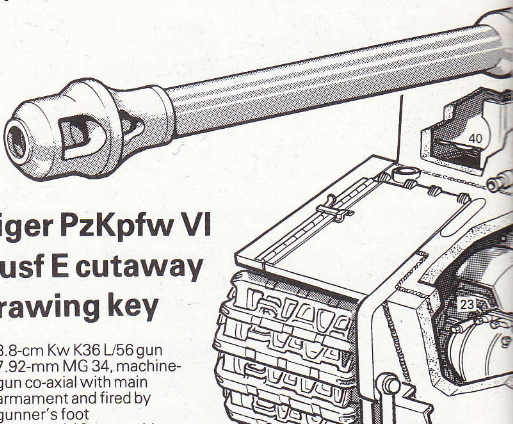
The Sharpshooters had been ordered into the village without time for a proper reconnaissance. The forward force of four Cromwell tanks moved through the village just in time to be spotted by Wittmann, who had at his immediate call a small force of four Tigers and a PzKpfw IV. Within minutes three of this forward group of Comets (they were in fact a headquarters troop) had been knocked out and in his turn Wittmann advanced back through the village. He soon came up against the leading tanks of a column of vehicles that extended back along the road to Caumont, and there was a brief flurry of tank gunfire during which Wittmann's tank was hit by at least one shot from the 17-pdr gun of a Sherman Firefly; the thick carapace of the Tiger was able to take the strike without the usual dire effects. As he withdrew Wittmann came up against the one Comet that had survived the first engagement and managed to knock out that tank also. It was then time for him to withdraw to replenish his fuel and ammunition.

By this time Wittmann had a good impression of the strength and nature of the force he was up against. By then moving against the flank of a small force of Sherman tanks he was able to knock them out progressively. Some of these Shermans were Fireflies, the only vehicles in the vicinity that had the gun power to penetrate the armour of the Tiger 1. Once Wittmann had knocked these out, the rest of the British formation, armed only with the short 75-mm (2.95-in) turret guns, was unable to inflict any damage upon the Tiger, and they too were progressively put out of action by the Tiger's 88-mm (3.46-in) gun.

Wittmann had already noted that these Shermans were part of a column that extended along a local road that led to a location known as Point 213. This road was narrow and lined with thick hedges. By knocking out a halftrack at the extreme end of this road Wittmann was thus able to bottle up a column of trucks, halftracks and Universal Carriers which he was then able to destroy by the simple expedient of driving along the side of the road and firing into each vehicle one by one. Crews attempting to escape were shot down by the Tiger's machine-guns. The destruction and carnage were considerable, but Wittmann soon learned he had rather overdone things. With the column destroyed he moved back into Villers-Bocage along with the rest of his small force, only to be ambushed by a reorganized force from the column he had originally engaged at the far end of the village. Wittmann drove right into a carefully-laid ambush and in the resultant fire fight his Tiger was knocked out. Wittmann himself escaped on foot and survived to learn that he had almost single-handedly held up the advance of the entire 7th Armoured Division during a critical period.

More decorations and a promotion followed, but Wittmann was soon back in action. He was not destined to last long, for the Normandy terrain largely negated the long-range firepower of the Tiger's gun and the Allied tanks were available in large numbers. On 8 August his unit was in action near a village near Cintheaux against a large number of Shermans of the Canadian 4th Armoured Division. Although the Tigers were able to open fire at long range, the range soon shortened and Wittmann's Tiger became surrounded by at least five Shermans, one of which was finally able to get in that vital shot that knocked out the Tiger; there were no survivors.

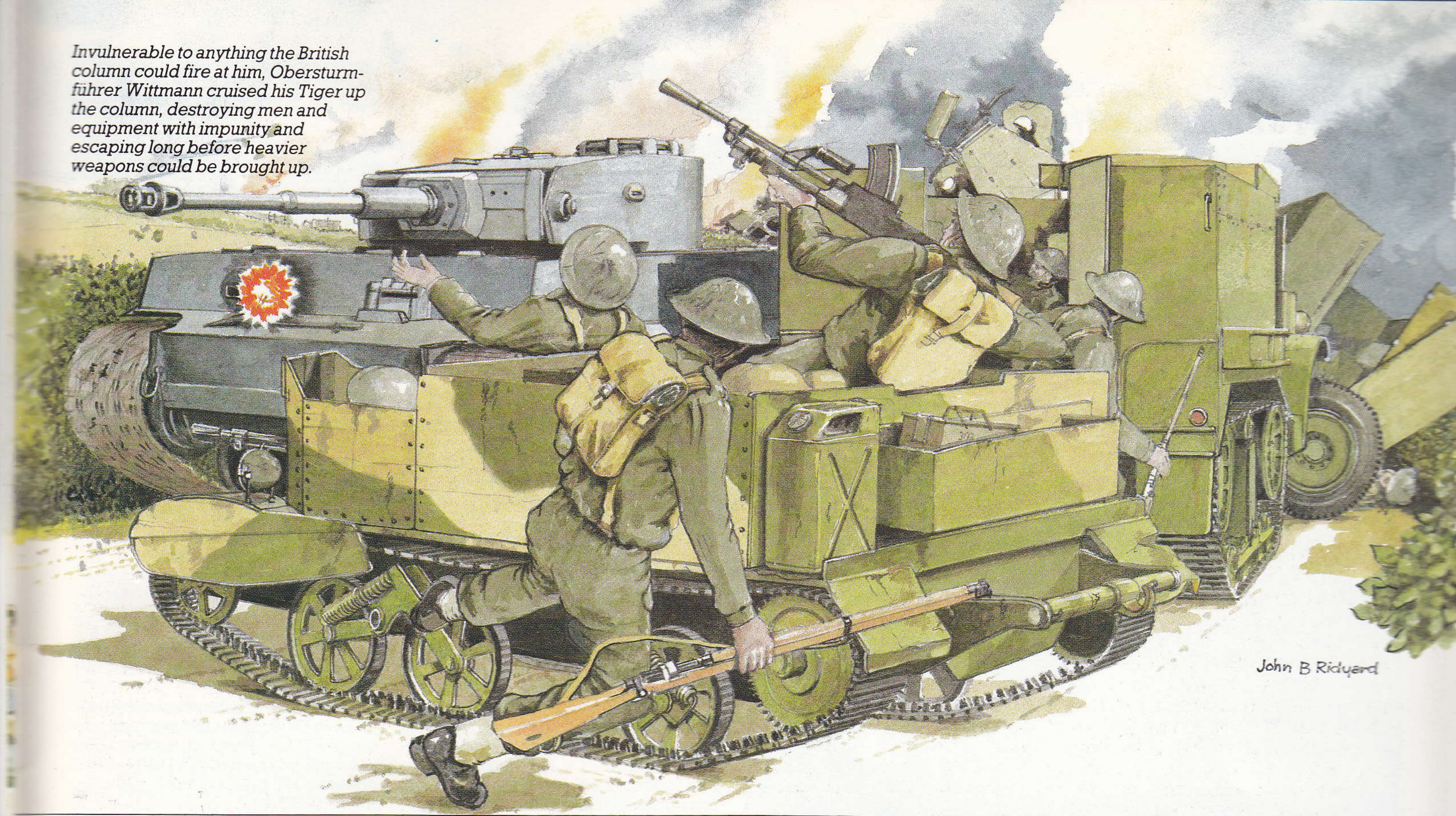
By the time he died Michael Wittmann had been credited with the destruction of 138 tanks and assault guns, and of 132 anti-tank guns. This tally had taken him less than two years.



Tiger PzKpfw VI Ausf E cutaway drawing key

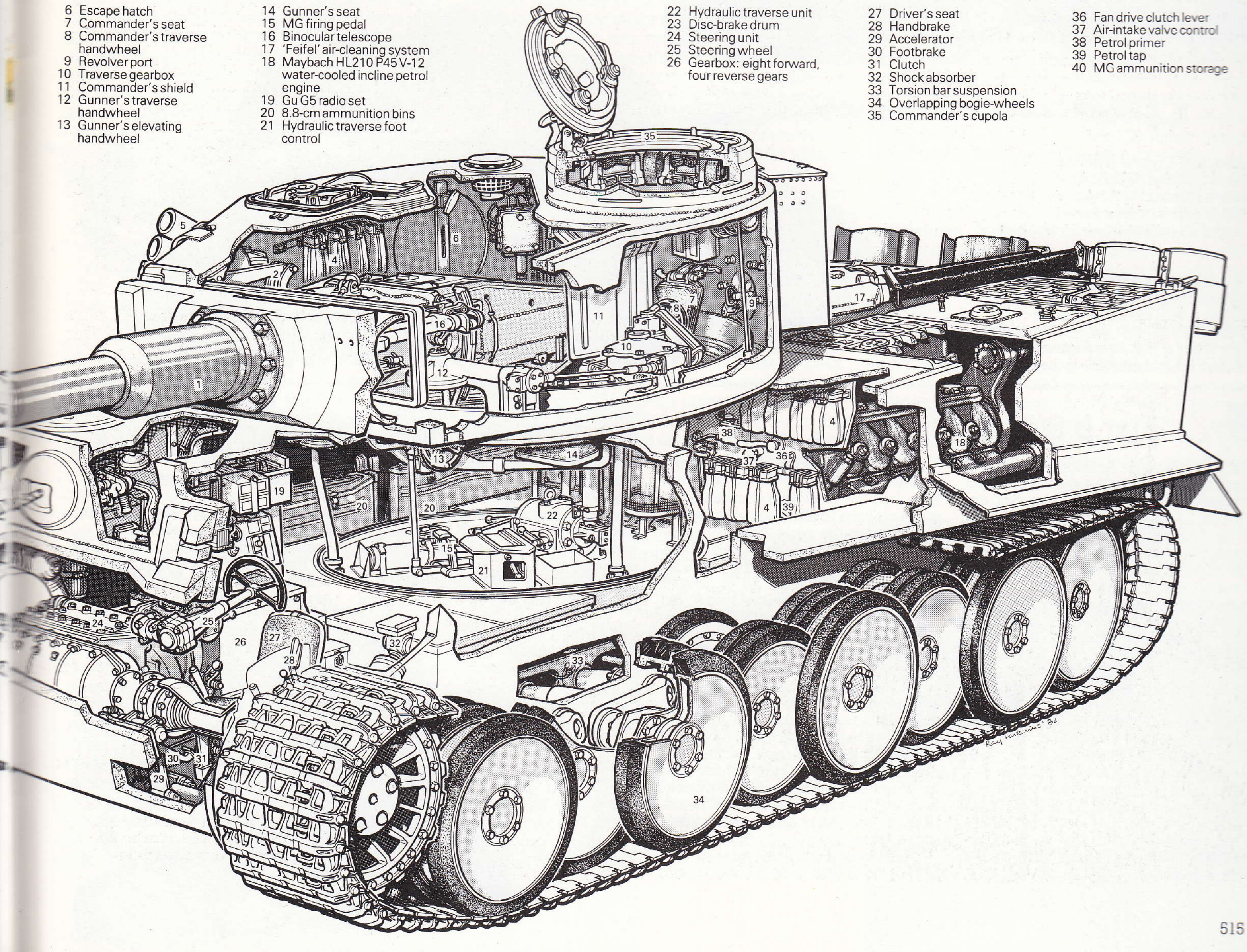
1. 8.8-cm Kw K36 L/56 gun
2. 7.92-mm MG 34, machine-gun co-axial with main armament and fired by gunner's foot
3. 7.92-mm MG 34 machine-gun
4. 7.92-mm MG 34 machine-gun ammunition
5. Smoke generator discharge

The only way to knock out the uncommonly massive Tiger was to get up close. Unfortunately the Tiger's 88-mm gun made this an extremely hazardous operation.



Invulnerable to anything the British column could fire at him, Obersturmführer Wittmann cruised his Tiger up the column, destroying men and equipment with impunity and escaping long before heavier weapons could be brought up.

6 Escape hatch
7 Commander's seat
8 Commander's traverse handwheel
9 Revolver port
10 Traverse gearbox
11 Commander's shield
12 Gunner's traverse handwheel
13 Gunner's elevating handwheel
14 Gunner's seat
15 MG firing pedal
16 Binocular telescope
17 'Feifel' air-cleaning system
18 Maybach HL210 P45 V-12 water-cooled incline petrol engine
19 Gu G5 radio set
20 8.8-cm ammunition bins
21 Hydraulic traverse foot control
22 Hydraulic traverse unit
23 Disc-brake drum
24 Steering unit
25 Steering wheel
26 Gearbox: eight forward, four reverse gears
27 Driver's seat
28 Handbrake
29 Accelerator
30 Footbrake
31 Clutch
32 Shock absorber
33 Torsion bar suspension
34 Overlapping bogie-wheels
35 Commander's cupola
36 Fan drive clutch lever
37 Air-intake valve control
38 Petrol primer
39 Petrol tap
40 MG ammunition storage



GERMANY

Panzerkampfwagen VI Tiger II heavy tank

No sooner was the Tiger in production than the decision was taken to develop an even better armed and armoured version, especially to counter any vehicle that the Soviets could introduce in the future. Once again Henschel and Porsche were asked to prepare designs. Porsche first designed a tank based on the earlier VK 4501 design and armed with a 15-cm (5.9-in) gun. This was rejected in favour of a new design with a turret-mounted 88-mm (3.46-in) gun, which was soon cancelled as its electric transmission used too much copper, which at that time was in short supply. By this time the turrets were already in production and these were subsequently fitted to early-production Henschel tanks. The **VK 4503(H)** Henschel design was completed in October 1943, somewhat later than anticipated as a decision was taken to incorporate components of the projected Panther II tank.

Production of the Tiger II, or **Panzerkampfwagen VI Tiger II Ausf B (SdKfz 182)** to give its correct designation, got under way at Kassel in December 1943 alongside the Tiger, the first 50 production vehicles being completed with the Porsche turret. All subsequent tanks had the Henschel turret, and a total of 485 vehicles was built.

The Tiger II first saw action on the Eastern Front in May 1944 and on the Western Front in Normandy in August of the same year, the Western Allies calling it the Royal Tiger or King Tiger while the Germans called it the **Königstiger** (King Tiger).

In many respects the Tiger II was similar in layout to the Panther tank, and was powered by the same engine as later production Panthers, resulting in a much lower power-to-weight ratio, and the tank was therefore much slower and less mobile than the Panther. While its armour gave almost complete protection against all of the guns fitted to Allied tanks, the Tiger II was unreliable and its bulk made it difficult to move about the battlefield and to conceal. Many were abandoned or destroyed by their crews when they ran out of fuel and no additional supplies were to hand.

The hull of the Tiger II was of all-welded construction with a maximum thickness of 150 mm (5.9 in) in the front of the hull. The driver was seated at the front on the left, with the bow machine-gunner/radio operator to his right. The turret was of welded construction with a maximum thickness of 100 mm (3.9 in) at the front, and accommodated the commander and gunner on the left with the loader on the right. The engine was at the hull rear. Main armament comprised a long-barrelled 88-mm (3.46-in) KwK 43 gun that could fire armour-piercing and HE ammunition, the former having a much higher muzzle velocity than the equivalent round fired by the Tiger. A 7.92-mm (0.31-in) MG 34 was mounted co-axial with the main armament, and another weapon was mounted in the hull front. Totals of 84 rounds of 88-mm (3.46-in) and 5,850 rounds of 7.92-mm (0.31-in) machine-gun ammunition were carried.

The Tiger II chassis was also used as the basis for the **Jagdtiger B**, which was armed with a 128-mm (5.04-in) gun in a new superstructure with limited traverse; only 48 of these powerful tank destroyers had been built by the end of the war.

Specification

PzKpfw VI Tiger II Ausf B

Crew: 5

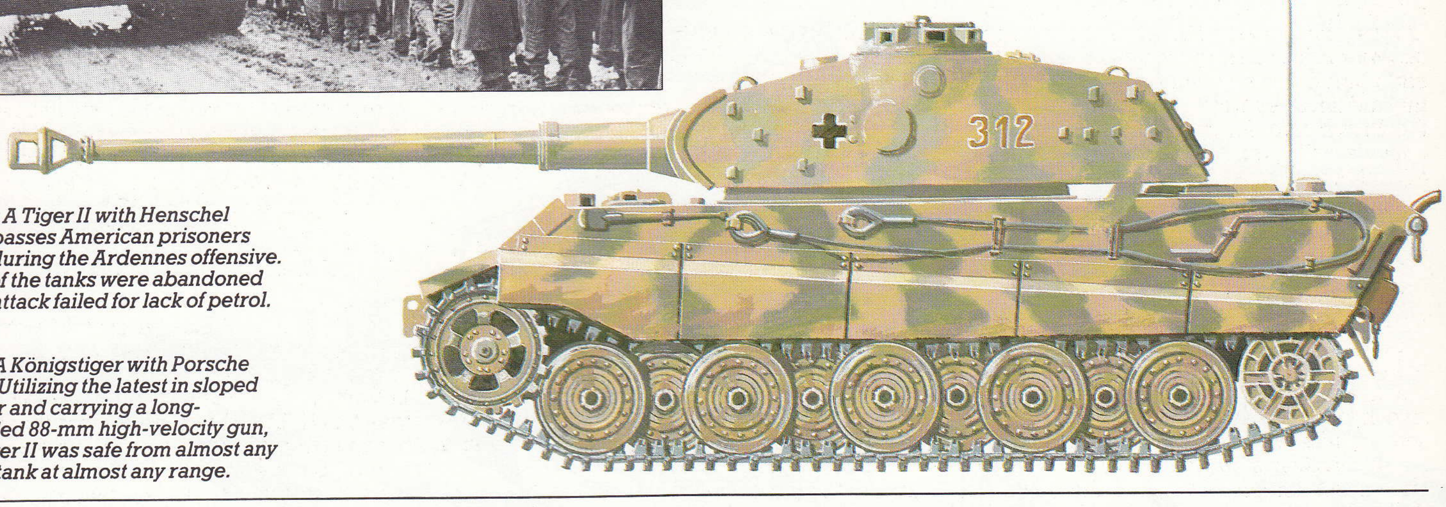
Weight: 69700 kg (153,660 lb)

Dimensions: length (including armament) 10.26 m (33 ft 8 in); length (hull) 7.26 m (23 ft 9.75 in); width 3.75 m (12 ft 3.5 in); height 3.09 m (10 ft 1.5 in)

Powerplant: one Maybach HL 230 P 30 12-cylinder petrol engine developing 700 hp (522 kW)

Performance: maximum road speed 38 km/h (24 mph); maximum road range 110 km (68 miles); fording 1.6 m (5 ft 3 in); gradient 60 per cent; vertical obstacle 0.85 m (2 ft 10 in); trench 2.50 m (8 ft 2 in)

Above: A Tiger II with Henschel turret passes American prisoners taken during the Ardennes offensive. Many of the tanks were abandoned as the attack failed for lack of petrol.



Right: A Königstiger with Porsche turret. Utilizing the latest in sloped armour and carrying a long-barrelled 88-mm high-velocity gun, the Tiger II was safe from almost any Allied tank at almost any range.

ITALY

Fiat L 6/40 light tank

In the 1930s Fiat Ansaldo built an export tank based on the chassis of the L3 tankette, itself a development of the British Carden Lloyd Mark VI tankette. The first prototype was armed with twin machine-guns in the turret and a 37 mm gun in a sponson. This was followed by models with a turret-mounted 37-mm gun and a co-axial machine-gun, and another with twin turret-mounted 8-mm (0.315-in) machine-guns. The production version, designated **Carro Armato L 6/40**, was built from 1939 and armed with a Breda Model 35 20-mm cannon with a co-axial Breda Model 38 8-mm (0.315-in) machine gun. Totals of 296 rounds of 20-mm and 1,560 rounds of 8-mm (0.35-in) ammunition were carried. At the time of its introduction the L 6/40 was roughly equivalent to the German PzKpfw II, and was used by reconnaissance units and cavalry divisions. A total of 283 vehicles was built, and in addition to being used in Italy itself the type was also used in North Africa and on the Russian front. The L 6/40 continued in service with the militia in post-war Italy, finally being phased out of service in the early 1950s.

The hull of the L 6/40 was of all-riveted construction varying in thickness from 6 mm (0.24 in) to 30 mm (1.26 in). The driver was seated at the front right, the turret was in the centre, and the engine at the rear. The turret was manually operated and could be traversed through 360°; its weapons could be elevated from −12° to +20°. The commander also acted as gunner and loader, and could enter the vehicle via the hatch in the turret roof or via a door in the right side of the hull. Suspension on each side consisted of two bogies each with two road wheels, with the drive sprocket at the front and idler at the rear; there were three track-return rollers.

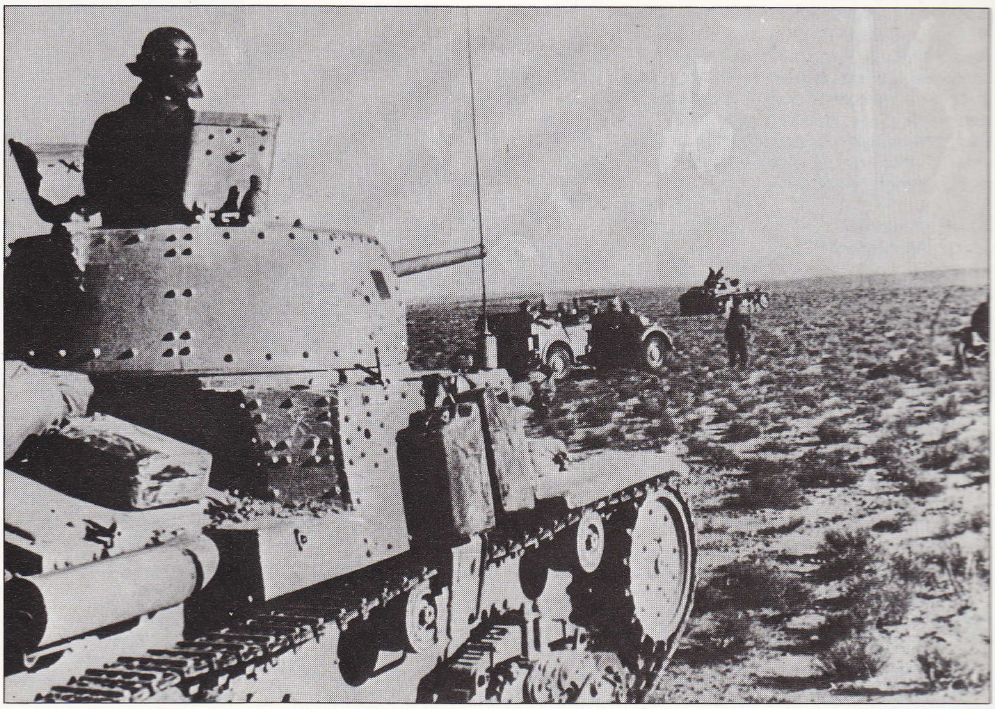
There was also a flamethrower version of the L 6/40 in which the 20-mm cannon was replaced by a flamethrower for which 200 litres (44 Imp gal) of flame liquid were carried. The command model had additional communications equipment and an open-topped turret. Some of the L 6/40s were completed as **Semovente L40 47/32** self-propelled anti-tank guns, which were essentially L 6/40 with the turret removed and a 47-mm anti-tank gun mounted in the hull front to the left of the driver. This had an elevation from −12° to +20°, with a total traverse of 27°; 70 rounds of ammunition were carried. In addition to conversions from

Continued on page 518

A knocked-out L 6/40 light tank is inspected by Australians in the desert. In spite of being unsuitable for front-line service, the L 6/40 saw action in North Africa and the USSR as well as in Italy.

Rommel in Gazala

With the Italians thoroughly beaten in North Africa, Hitler had to intervene to save Il Duce. A small armoured force was despatched to Tunisia, under the command of Erwin Rommel.



An M 13/40 and a PzKpfw III of the Afrika Korps approach Gazala. Much of Rommel's force comprised Italian troops and equipment.

Rommel had first made his name in a daring infantry raid on the Italian front in October 1917, and the same audacity that enabled him to raid deep behind established positions marked his operations once he became a Panzer officer. His part in the Fall of France in 1940 was again characterized by a deep Panzer raid into the French rear at Avesnes and the subsequent dash to the Channel Coast. By 1941 he was in North Africa carrying out a series of armoured operations that constantly defeated numerically superior British and Commonwealth forces which were unable to adapt to the tactics of tank warfare as carried out by Rommel.

By May 1942 Rommel had rapidly learned that armoured warfare in the desert entailed using a new set of 'rules'. In the wide open spaces of the unpopulated desert, mobility and firepower took on new meanings. In the desert there was always a flank to be turned, and positional warfare became increasingly meaningless as mobile forces could turn up from any point of the compass.

In May 1942 Rommel was ready to begin what was to become one of the classic examples of this particular approach to warfare. In that month he had to hand a total of 561 tanks (333 German and 228 Italian) ready to take on a superior British force which had over 900 tanks and numbers of new anti-tank guns. But Rommel did have several advantages. One was that the British tank force was scattered in small packets, and another was that the Luftwaffe had a local numerical superiority that was to serve Rommel well in the days ahead. The British were emplaced in a long defensive line south of Gazala, well protected by massive minefields and located mainly in well-defended 'boxes'. They were expecting Rommel to attack and were not disappointed.

Rommel's attack plan was simple and typical of his methods. Using the relatively immobile Italian infantry to pin the British in their defensive line, he moved his main striking forces south. These were made up of the crack Italian Ariete Division, a unit that Rommel was later to state never let him down, and the bulk of the Afrika Korps made up of the 15th and 23rd Panzer Divisions and the 90th Light Division. These moved south around the end of the British defence lines and then moved north as the Italian Trieste Division carried out a frontal attack on the southern portion of the line. Within a few hours Rommel's forces were well to the rear of the static British lines and began to move towards the Knightsbridge Box, an area which became the focal point of the Gazala battle.

As soon as the British became aware of Rommel's move they started a protracted series of armoured counterattacks against the attackers. But while the German and Italian units were operating as cohesive formations under central control, the British tank attacks were made by fragmented units operating under various higher tactical controls. Many of these counterattacks were made in the traditional British cavalry manner by lines of tanks simply charging towards the Germans, who destroyed them by a combination of tank gun and anti-tank gun fire, including numbers of 37-mm and 88-mm (3.46-in) anti-aircraft towed weapons that accompanied the Panzers into action. These fragmented attacks, including some that included numbers of the new 75-mm (2.95-in) gun-armed Grant tanks newly arrived from the United Kingdom, did manage some successes, and gradually Rommel's forces diminished in numbers and effectiveness as supplies of ammunition and fuel were expended. Rommel himself saved this situation by leading a supply column straight through the British minefields and lines on the night of 29 May. He was able to do this mainly because the minefields were not covered by defensive fire and thus Rommel was able to bring forward the fuel to keep his units in motion.

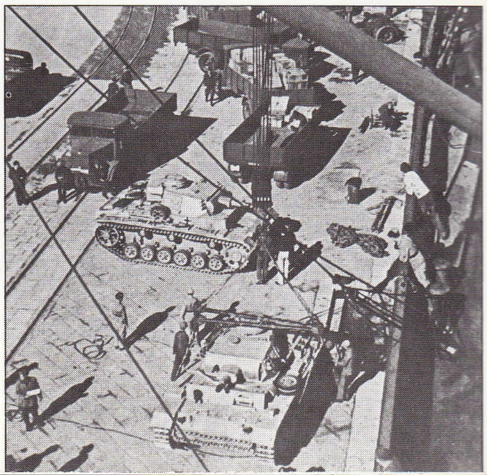
Attack and counterattack

The Gazala battles went on for two weeks in series of attacks and counterattacks that gradually threatened to bring both sides to a complete standstill from sheer exhaustion. As a general rule, the Germans and Italians were able to keep the overall initiative as they were able to keep switching the point they wished to attack and were always able to move out to the south when things went against them. The British and Commonwealth troops generally remained static or else fell back towards their main supply bases in the El Adem and Tobruk areas. From time to time frontal attacks were made against the main line south of Gazala. By mid-June Rommel's supply line was in a precarious state, to the extent that his armoured units were keeping going on captured supplies alone. The Grants, when encountered, were a particular headache for the Germans, who were able to destroy them only by the use of their 88-mm (3.46-in) anti-aircraft guns, although the 37-mm anti-aircraft guns were only marginally less effective.

On 20 June the Germans were approaching the perimeter of the Tobruk defences. Tobruk is one of the few ports on the North African coastline, and with this port under German control the Afrika Korps would not have to depend on supply lines reaching back as far west as Tripoli. As usual the British and Commonwealth troops fought doggedly, but they were operating from static defensive positions, and once the Germans were through the perimeter in true *Blitzkrieg* fashion they were able to roll up the line and take the port along with 30,000 prisoners and masses of supplies and equipment. They were able to put the latter two to good use in the campaigning days ahead.

The fall of Tobruk had a dreadful effect on Allied morale, but the Gazala/Tobruk battles had one long-term outcome that Rommel could not foresee. With a great success and a new promotion behind him, he carried on his advance to the east, only to come up against the defence lines carefully emplaced at Alam Halfa south of El Alamein. There the Afrika Korps was finally halted in a battle that the overextended German armoured units were unable to carry. To the south was the Quattara Depression where tanks could not venture. This time there could be no armoured sweep round an open flank, and Rommel could not break through with his deleted numbers. Thus July 1942 saw the beginning of the end for the Afrika Korps.

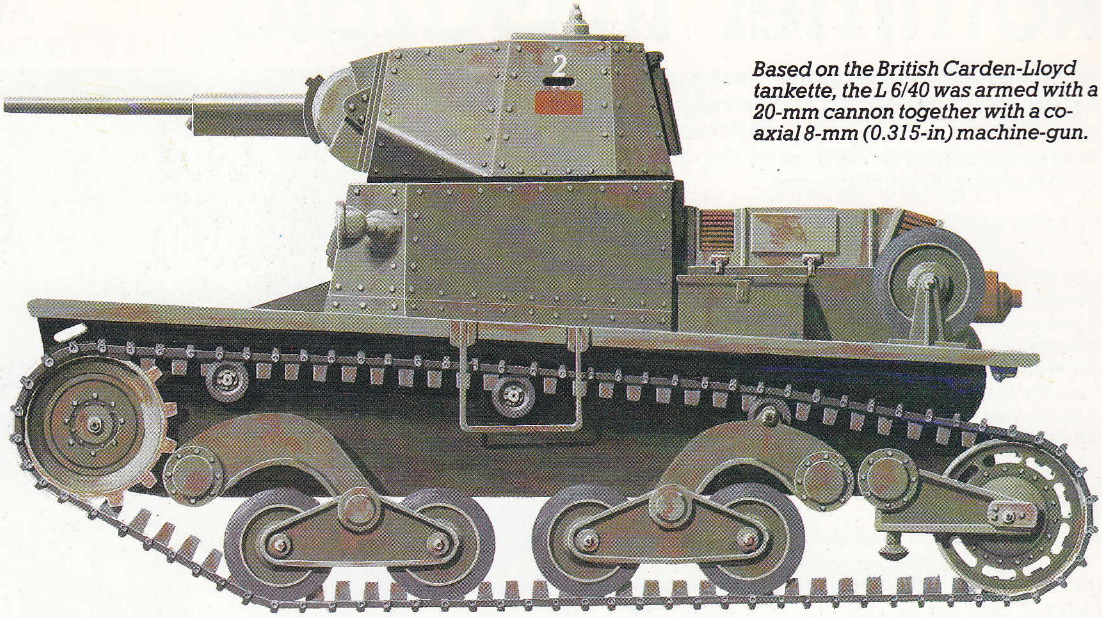
PzKpfw IVs are unloaded at Tunis. Rommel's operations in the desert were hampered by the fact that many of his supply ships were sunk by the Royal Navy or by the RAF.



Fiat L 6/40 light tank (continued)

the L 6/40 tank about 300 vehicles were built from scratch and these saw service in Italy, North Africa and the USSR from 1941. A command version was also built on the same chassis and this had its armament replaced by an 8-mm (0.315-in) Breda machine-gun, which was made to look like the larger calibre gun to make detection of the vehicle more difficult.

Specification
Carro Armato L 6/40
Crew: 2
Weight: 6800 kg (14,991 lb)
Dimensions: length 3.78 m (12 ft 5 in); width 1.92 m (6 ft 4 in); height 2.03 m (6 ft 8 in)
Powerplant: one SPA 18D four-cylinder petrol engine developing 70 hp (52 kW)
Performance: maximum road speed 42 km/h (26 mph); maximum range 200 km (124 miles); fording 0.8 m (2 ft 8 in); gradient 60 per cent; vertical obstacle 0.7 m (2 ft 4 in); trench 1.7 m (5 ft 7 in)



Based on the British Carden-Lloyd tankette, the L 6/40 was armed with a 20-mm cannon together with a co-axial 8-mm (0.315-in) machine-gun.

ITALY

Fiat M 11/39 and M 13/40 medium tanks

In 1937 the prototype of the **Carro Armato M 11/39** tank was built, with the suspension system of the L3 tankette but with six road wheels on each side. In layout this was similar to the American M3 Lee tank, but with a 37-mm (rather than 75-mm/2.95-in) gun in the right sponson, driver on the left, and in the centre of the hull a one-man turret armed with twin 8-mm (0.315-in) machine-guns. Further development resulted in a model with eight road wheels and this basic chassis was used for all subsequent Italian medium tanks. Only 100 M 11/39s were built as it was considered that the design was already obsolete, and in 1940 70 of these were sent to North Africa where many were captured or destroyed during the first battles with the British army.

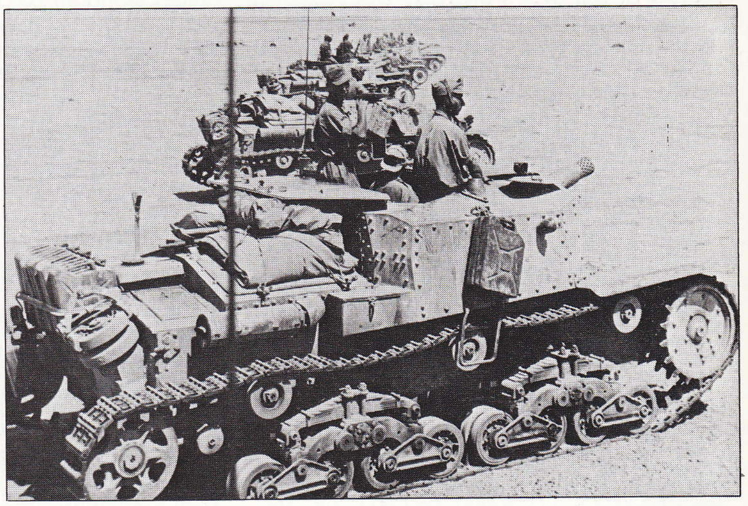
Further development resulted in the **M 13/40** which had a similar chassis but a redesigned hull of riveted construction varying in thickness from 6 mm (0.24 in) to 42 mm (1.65 in). The driver was seated at the front of the hull on the left with the machine-gunner to his right; the latter operated the twin Modello 38 8-mm (0.315-in) machine-guns as well as the radios. The two-man turret was in the centre of the hull, with the commander/gunner on the right and the loader on the left, and with a two-piece hatch cover in the turret roof. Main armament comprised a 47-mm 32-calibre gun with an elevation of +20° and a depression of −10°; turret traverse was 360°. A Modello 38 8-mm (0.315-in) machine-gun was mounted co-axial with the main armament and a similar weapon was mounted on the turret roof for anti-aircraft defence. Totals of 104 rounds of 47-mm and 3,048 rounds of 8-mm (0.315-in) ammunition were carried. The engine was at the rear of the hull, its power being transmitted to the gearbox at the front of the hull via a propeller shaft. Suspension on each side consisted of four double-wheel articulated bogies mounted on two assemblies each carried on semi-elliptic leaf springs, with the idler at the rear; there were three track-return rollers.

The M 13/40 was built by Ansaldo-Fossati at the rate of about 60 to 70 vehicles per month, a total of 779 being produced. The tank was widely used in North Africa by the Italian army but was cramped, proved to be very unreliable in service and was prone to catching fire when hit by anti-tank projectiles.

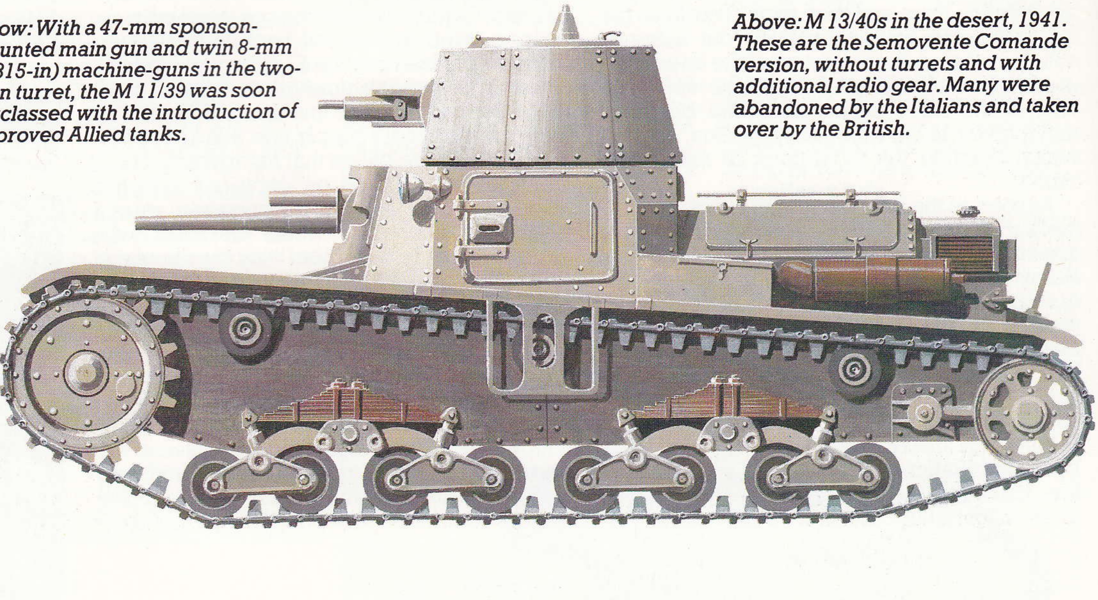
Many vehicles were captured by the British army after being abandoned by their crews and subsequently issued to the British 6th Royal Tnk Regiment (RTR) and the Australian 6th Cavalry Regiment early in 1941 when tanks were in a very short supply on the Allied side. The Australian regiment had three squadrons of captured vehicles which they called Dingo, Rabbit, and Wombat. So that they were not engaged by Allied units, white kangaroos were painted on the sides, glacis and turret rear.

The **Semovente Comando M 40** command vehicle was basically the M 13/40 tank with its turret removed and fitted with additional communications equipment for use in the command role. Further development of the M 13/40 resulted in the M 14/41 and M 15/42, for which there is a separate entry.

Specification
Carro Armato M 13/40
Crew: 4
Weight: 14000 kg (30,865 lb)
Dimensions: length 4.92 m (16 ft 2 in); width 2.2 m (7 ft 3 in); height 2.38 m (7 ft 10 in)
Performance: one SPA TM40 eight-cylinder diesel engine developing 125 hp (93 kW)
Performance: maximum road speed 32 km/h (20 mph); maximum range 200 km (125 miles); fording 1.0 m (3 ft 3 in); gradient 70 per cent; vertical obstacle 0.8 m (2 ft 8 in); trench 2.1 m (6 ft 11 in)



Above: M 13/40s in the desert, 1941. These are the Semovente Comande version, without turrets and with additional radio gear. Many were abandoned by the Italians and taken over by the British.



Below: With a 47-mm sponson-mounted main gun and twin 8-mm (0.315-in) machine-guns in the two-man turret, the M 11/39 was soon outclassed with the introduction of improved Allied tanks.

ITALY

Fiat M 15/42 medium tank

The **Carro Armato M 14/41** was essentially the M 13/40 fitted with a more powerful diesel engine which was equipped with air filters designed to cope with the harsh conditions of the desert. Production amounted to just over 1,100 of these vehicles, which had a similar specification to the M 13/40 except for an increase in speed to 33 km/h (20 mph) and in weight to 14.5 tonnes. Further development resulted in the **Carro Armato M 15/42**, which entered service in early 1943. A total of 82 of these was built, most being issued to the Ariete Division which took part in the Italian attempt to deny Rome to the Germans in September 1943. Some of these vehicles were captured by the Germans and then used against the Allies.

The M 15/42 was slightly longer than the M 14/41 and distinguishable from it by the lack of a crew access door in the left side of the hull. It was driven by a more powerful engine which made it slightly faster, and had improved armour protection and other more minor modifications as a result of operator comments.

The hull of the M 15/42 was of all-riveted construction which varied in thickness from 42 mm (1.65 in) to 14 mm (0.55 in), with a maximum of 45 mm (1.77 in) on the turret front. The driver was seated at the front of the hull on the left, with the bow machine-gunner to his right, the latter operating the twin Breda Modello 38 8-mm (0.315-in) machine-guns as well as the radios. The turret was in the centre of the hull and armed with a 47-mm 40-calibre gun with an elevation of +20° and a depression of −10°; turret traverse, which was electric, was 360°. A Modello 38 8-mm (0.315-in) machine-gun was mounted co-axial with the main armament, and a similar weapon was mounted on the turret roof for anti-aircraft defence. Totals of 111 rounds of 47-mm and 2,640 rounds of 8-mm (0.315-in) ammunition were carried. Suspension on each side consisted of four double-wheel articulated bogies mounted in two assemblies each carried on semi-elliptical springs, with the drive sprocket at the front and the idler at the rear; there were three track-return rollers. The engine was at the rear of the hull and coupled to a manual gearbox with eight forward and two reverse gears.

By the time the M 15/42 had been introduced into service it was already obsolete, and design of another tank had been under way for several years. In 1942 the first prototypes of the **Carro Armato P 40** heavy tank were built. This was a major advance on the earlier Italian tanks and used a similar type of suspension to the M 15/42. The layout was also similar with the driver at the front, turret in the centre and engine at the rear. Armour protection was much improved and the hull and turret sides sloped to give maximum possible protection within the weight limit of 26 tonnes. The P 40 was powered by a V-12 petrol engine that developed 420 hp (313 kW) to give it a maximum road speed of 40 km/h (25 mph). Main armament comprised a 75-mm (2.95-in) 34-calibre gun with a co-axial Modello 38 8-mm (0.315-in) machine-gun. Totals of 75 rounds of 75-mm (2.95-in) and 600 rounds of machine-gun ammunition were carried. The P 40 was produced by Fiat in northern Italy, but none of these entered service with the Italian army and most were subsequently taken over by the German army, which ensured continued production for itself, some reports stating that over 50 vehicles were built for German use.

Specification

Carro Armato M 15/42

Crew: 4

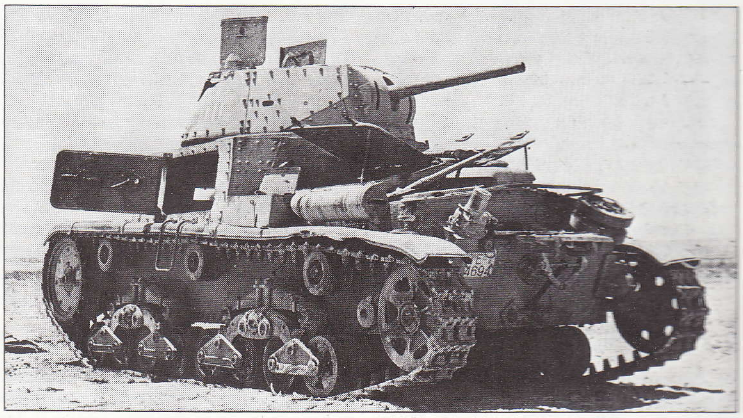
Weight: 15500 kg (34,800 lb)

Dimensions: length 5.04 m (16 ft 7 in); width 2.23 m (7 ft 4 in); height 2.39 m (7 ft 11 in)

Powerplant: one SPA 15 TB M42 eight-cylinder petrol engine developing 192 hp (143 kW)

Performance: maximum road speed 40 km/h (25 mph); maximum range 220 km (136 miles); fording 1.0 m (3 ft 3 in); gradient 60 per cent; vertical obstacle 0.8 m (2 ft 8 in); trench 2.10 m (6 ft 11 in)

A squadron of M 14/41 tanks in Cyrenaica in 1942. More than 1100 of these tanks, in effect tropicalized M 13/40s, were produced.



Another M 14/41, abandoned after the first battle of Alamein. The M 15/42 looked similar but had no side hatch. Only 82 were built.

JAPAN

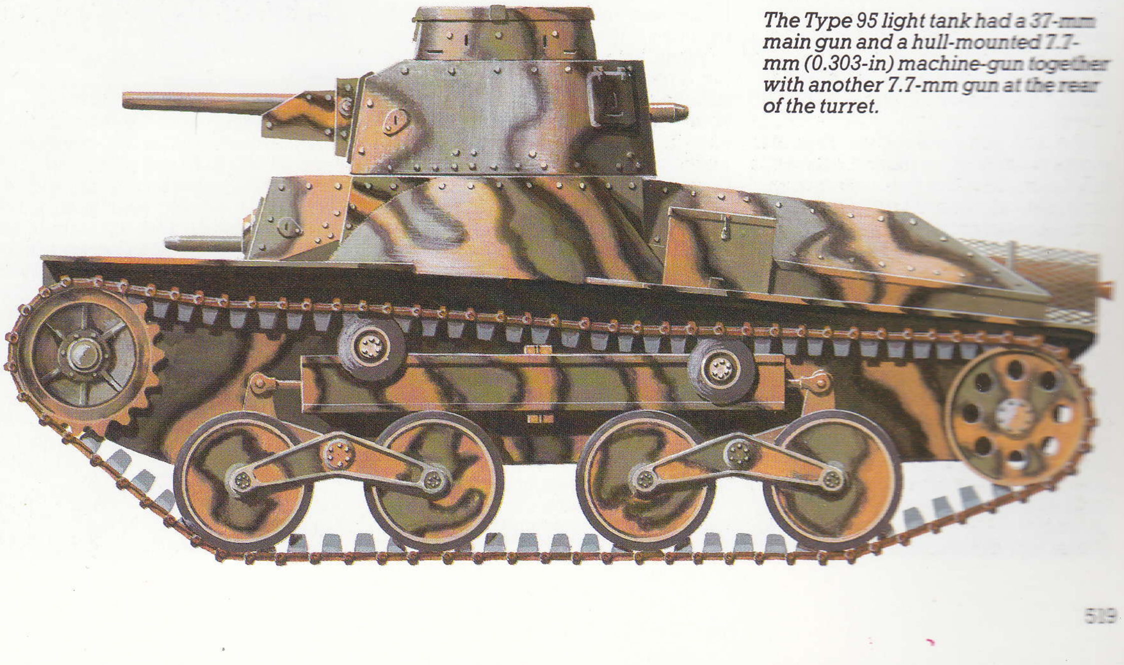
Type 95 light tank

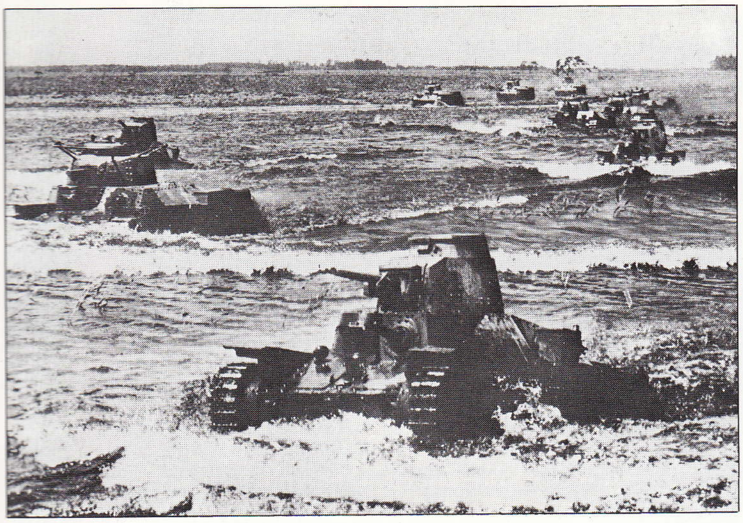
The **Type 95** light tank was developed to meet the requirements of the Japanese army in the early 1930s, the first two prototypes being completed in 1934 by Mitsubishi Heavy Industries. These were tested in China and Japan and the type was then standardized as the Type 95 light tank, the company calling the vehicle the **HA-GO** while the army called the vehicle the **KE-GO**. Over 1,100 Type 95s were built before production was completed in 1943, although some sources have stated that production continued until 1945.

The hull and turret of the Type 95 were of riveted construction and varied in thickness from 0.25 in (6 mm) to a maximum of 0.55 in (14 mm). The driver was seated at the front on the right with the bow machine-gunner to his left. The latter operated the Type 91 6.5-mm (0.255-in) weapon (with a traverse of 35° left and right), which was later replaced by the Type 97 7.7-mm (0.303-in) machine-gun. The turret was in the centre of the hull, offset slightly to the left and fitted with a Type 94 37-mm tank gun firing armour-piercing and HE ammunition. This gun was later replaced by the Type 98 gun of a similar calibre but with a higher muzzle velocity. There was no co-axial machine-gun, but another machine-gun was mounted in the turret rear on the right side. Totals of 2,970 rounds of ammunition were carried for the two machine-guns and of 119 rounds for the main armament. A major drawback of this tank, like many French tanks of the period, was the fact that the tank commander also had to aim, load and fire the main armament in addition to carrying out his primary role of commanding the tank.

The Mitsubishi six-cylinder air-cooled diesel was mounted in the hull rear and coupled to a manual transmission with one reverse and four forward gears. Steering was of the clutch and brake type, and suspension of the bell crank type consisting of each side of

The Type 95 light tank had a 37-mm main gun and a hull-mounted 7.7-mm (0.303-in) machine-gun together with another 7.7-mm gun at the rear of the turret.





Type 95 tanks cross paddy fields while on exercise. The Type 95 sufficed in its anti-infantry role, as the Japanese army did not come up against any armour of consequence until meeting the Marines in 1943.

A Type 95 at speed, probably in Manchuria. Japan's conquests were aided considerably by the fact that none of her opponents possessed any significant amount of armour, nor any anti-tank capability.

four rubber-tyred road wheels, with the drive sprocket at the front and idler at the rear; there were two track-return rollers.

In those days no air-conditioning systems were available to keep the interior of the tank cooled so the walls of the crew compartment were lined with asbestos padding which in addition gave some protection to the crew from injury when travelling across country.

In 1943 a few Type 95 light tanks were modified to carry the 57-mm gun as fitted to the Type 97 medium tank under the name **KE-RI**, but the variant was not very successful as the turret was too cramped. The **KE-NU** was the Type 95 with the complete turret of the Type 97 CHI-HA medium tank. The Type 95 was succeeded in production by the **Type 98 KE-NI** light tank, but only about 100 of these were built before production was completed in 1943 as the type was not considered a very satisfactory design. The **Type 2 KA-MI** amphibious tank used automotive components of the Type 95 light tank, and this was widely used in the early Pacific campaigns of World War II. Japan also used tankettes on a large scale including the Types 92, 94 and 97, the last being the most common.

When used in China and during the early World War II campaigns against the Americans, the Type 95 proved a useful vehicle, but once confronted by American tanks and anti-tank guns it was outclassed.

Specification

Type 95

Crew: 4

Weight: 7400 kg (16,314 lb)

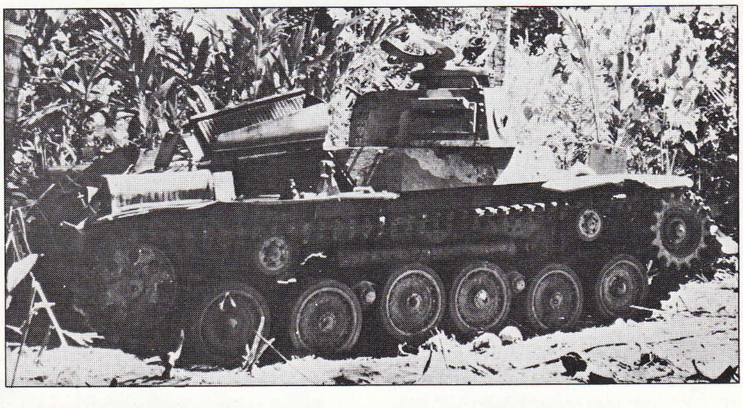
Dimensions: length 4.38 m (14 ft 4 in); width 2.057 m (6 ft 9 in); height 2.184 m (7 ft 2 in)

Powerplant: one Mitsubishi NVD 6120 six-cylinder air-cooled diesel engine developing 120 hp (89 kW)

Performance: maximum road speed 45 km/h (28 mph); maximum range 250 km (156 miles); fording 1.0 m (3 ft 3 in); gradient 60 per cent; vertical obstacle 0.812 m (2 ft 8 in); trench 2.0 m (6 ft 7 in)

JAPAN

Type 97 medium tank



Probably the best Japanese armoured vehicle to see any great amount of service, the Type 97 was a fairly advanced design that was handicapped by an inadequate gun.

In the mid-1930s a requirement was issued for a new medium tank to replace the Type 89B medium tank which by then was rapidly becoming obsolete. As the Engineering Department and the General Staff could not agree on the better design, two prototypes were built. Mitsubishi built the design of the Engineering Department while Osaka Arsenal built the design of the General Staff. There was in fact little to choose between the two designs, although the Mitsubishi tank was heavier and driven by a more powerful engine. The Mitsubishi prototype was standardized as the **Type 97 CHI-HA** medium tank and some 3,000 vehicles were built before production was finally completed in the middle of World War II.

The hull and turret of the Type 97 medium tank were of riveted construction that varied in thickness from 8 mm (0.30 in) to 25 mm (0.98 mm). The driver was seated at the front of the hull on the right, with the 7.7-mm (0.303-in) Type 97 machine-gunner to his left. The two-man turret was in the centre of the hull, offset to the right, and could be traversed manually through 360°. Main armament consisted of a 57-mm Type 97 gun with an elevation of +11° and depression of −9°, and another 7.7-mm (0.303-in) machine-gun was located in the turret rear. Totals of 120 rounds of 57-mm (80 high explosive and 40 of armour-piercing) and 2,350 rounds of 7.7-mm (0.303-in) ammunition were carried.

The 12-cylinder air-cooled diesel was mounted at the rear of the hull and transmitted power via a propeller shaft to the gearbox in the nose of the tank; the gearbox had four forward and one reverse gears. Steering was of the clutch and brake type, and suspension on each side consisted of six dual rubber-tyred road wheels, with the drive sprocket at the front and idler at the rear; there were three track-return rollers. The four central road wheels were paired and mounted on bell cranks resisted by armoured compression springs, while each end bogie was independently bell crank-mounted to the hull in a similar manner.

When first introduced into service the Type 97 was quite an advanced design apart from its main armament, which had a low muzzle velocity. A feature of most Japanese tanks of this period was that they were powered by diesel rather than petrol engines, which gave them a much increased operational range as well as reducing the ever-present risk of fire, the dread of any tank crew.

In 1942 the Type 97 medium tank (special) was introduced: this had a new turret armed with a 47-mm Type 97 gun that fired ammunition with a higher muzzle velocity and therefore improved penetration characteristics. This weapon used the same ammunition as Japanese anti-tank guns and therefore helped ammunition commonality in the front line.

The chassis of the Type 97 was also used as the basis for a number of other vehicles including a flail-equipped mineclearing tank, self-propelled guns (including the 150-mm/5.9-in **Type 38 HO-RO**), self-propelled anti-aircraft guns (including 20-mm and 75-mm/2.95-in), an engineer tank, a recovery vehicle and an armoured bridgelayer. Most of these were built in such small numbers that they played little part in actual operations. The Type 97 was replaced in production by the **Type 1 CHI-HE** medium tank, followed by the **Type 3 CHI-NU**, of which only 60 were built by the end of the war. The last Japanese medium tanks were the Type 4 and Type 5, but neither of these well-armed vehicles saw combat.

Specification

Type 97

Crew: 4

Weight: 15000 kg (33,069 lb)

Dimensions: length 5.516 m (18 ft 1 in); width 2.33 m (7 ft 8 in); height 2.23 m (7 ft 4 in)

Powerplant: one Mitsubishi 12-cylinder air-cooled diesel engine developing 170 hp (127 kW)

Performance: maximum road speed 38 km/h (24 mph); maximum range 210 km (130 miles); fording 1.0 m (3 ft 3 in); gradient 57 per cent; vertical obstacle 0.812 m (2 ft 6 in); trench 2.514 m (8 ft 3 in)

French Air Force

Combat Units: Part 2

Now assigned the roles of low-level tactical strike with HE or tactical nuclear bombs, the Dassault Mirage IVA force is now approaching the end of its service life, although 18 are being modified to carry ASMPs.

All-Mirage defence

Air-defence duties fall to five wings (13 squadrons) of the Commandement Air des Forces de Defence Aérienne (CAFDA), whose assets also include SAMs, AA guns and the STRIDA computerized warning and communications system, linked to other French services' equipment and NATO's parallel NADGE chain. Perceiving a weakness in low-altitude cover, France deployed Centaure acquisition radars in 1981-3 and is now adding Aladin ground-based radar in a programme extending between 1983 and 1986, but further enhancement is needed.

Although assigning some of its defences to the east to meet the Soviet threat, France is also concerned by the build-up in Libyan air power on the other side of the Mediterranean, and for this reason (as well as national prestige) has elected to form its own AWACS force rather than become a full member of the eastward-orientated NATO squadron of Boeing E-3A Sentries. (France does receive some information from the Alliance, however, in return for a small contribution to the E-3A's operating expenses.)

A production order is expected in 1986 for CAFDA's AWACS force, the Grumman E-2C Hawkeye and E-3A being prime contenders, with modified Transall C.160s and other types as outsiders.

CAFDA's alternative title might well be 'Dassault's Private Air Force', for it is equipped throughout with Mirage variants spanning three generations of this world-famous aircraft. Primary equipment is Mirage 170 F.1Cs, of which almost all have been delivered (including 89 F.1C-200s equipped with in-flight-refuelling probes) together with 20 F.1B trainers for an OCU. Their normal armament is the IR-guided Matra 550 Magic and radar-homing R.530 and Super 530F-1, the latter having a differential altitude capability optimized for the F.1C's Cyrano IV radar. Two units retain the ageing Mirage IIIC, of which one is based in Djibouti for local defence duties, including ground attack.

The latest Mirage 2000C is now on the point of entering AA service, and will do so with EC 2 at Dijon, where two squadrons of Mirage IIIEs and an OCU are in residence. EC 2 transferred from Tactical Command in July 1983, its task having been battlefield air superiority.

Most, if not all, the CAFDA squadrons will receive the Mirage 2000, from planned procurement by the end of 1988 of 158 (excluding the Mirage 2000N), but because of development delays with the intended intercept-optimized RDI radar, EC 2's aircraft will be equipped with the multi-mode RDM unit. They will therefore receive Super R.530F AAMs, whilst the Super 530D will wait until its associated RDI pulse-Doppler radar is ready.

A box of four Dassault Mirage F.1s, armed with Matra 550 Magic short-range dogfight missiles. Although a relatively conservative design, the F.1 has provided the Armée de l'Air with a very versatile fighter.

12 PASS ⑧

Ground defences of vital airfields have not been neglected in spite of the considerable investment in fighters, with the result that planned procurement of 150 twin 20-mm AA guns was increased to 272 in the 1977-82 defence programme. During the same period, 12 bases each received a squadron of Matra Crotale short-range, low-level SAMs, each unit having eight four-round launch vehicles and an allocation of 80 missiles.

In contrast with several other European countries, France intends to introduce its new front-line aircraft on a one-for-one basis, maintaining strength at 450, which in effect means an increase in combat potential because of greater aircraft capabilities. As before, the 'sharp end' will be supported by transport, training and electronic intelligence/jamming aircraft, of which mention will be made in the next part of this account.

Order of Battle

Commandement des Forces Aériennes Stratégiques (CoFAS)

Unit	*Name*	*Aircraft*	*Base*	*Role*
EB 1/91	Gascogne	Mirage IVA	BA118 Mont-de-Marsan	nuclear bomber
EB 2/91	Bretagne	Mirage IVA	BA120 Cazaux	nuclear bomber
ERV 1/93	Aunis	C-135F	BA125 Istres-le-Tube	inflight-refuelling
ERV 2/93	Landes	C-135F	BA118 Mont-de-Marsan	inflight-refuelling
ERV 3/93	Sologne	C-135F	BE702 Avord	inflight-refuelling
EB 1/94	Guyenne	Mirage IVA	BE702 Avord	nuclear bomber
EB 2/94	Marne	Mirage IVA	BA113 St Dizier-Robinson	nuclear bomber
EB 3/94	Arbois	Mirage IVA	BA116 Luxeuil-St Saveur	nuclear bomber
EMS 200	Luberon	S-3 IRBM	BA200 Apt-St Christol	nuclear missile
CIFAS 328	—	Mirage IVA Mirage IIIB Mirage IIIB-RV Noratlas SNB Magister, Alpha jet E	BA106 Bordeaux-Mérignac	crew conversion pilot conversion refuelling training navigator training instrument rating

Commandement Air des Forces de Defence Aérienne (CAFDA)

Unit	*Name*	*Aircraft*	*Base*	*Role*
EC 1/2	Cigognes	Mirage 2000C	BA102 Dijon-Longvic	air superiority
EC 2/2	Côte d'Or	Mirage IIIB/BE		pilot conversion
EC 3/2	Alsace	Mirage IIIE		tactical air support
EC 1/5	Vendée	Mirage F.1C	BA115 Orange-Caritat	air defence
EC 2/5	Ile de France	Mirage F.1C		air defence
EC 3/5	Comtat Venaissin	Mirage F.1B/C		pilot conversion
EC 1/10	Valois	Mirage F.1C	BA110 Creil-Senlis (det. Djibouti)	air defence
EC 2/10	Seine	Mirage IIIC		air defence
EC 3/10	Vexin	Mirage IIIC		air defence/air support
EC 1/12	Cambrésis	Mirage F.1C	BA103 Cambrai-Epinoy	air defence
EC 2/12	Picardie	Mirage F.1C		air defence
EC 3/12	Cornouailles	Mirage F.1C		air defence
ECTT 2/30	Normandie-Niemen	Mirage F.1C	BA112 Reims-Champagne	air defence
ECTT 3/30	Lorraine	Mirage F.1C		air defence
EC 24/118	—	various	BA118 Mont-de-Marsan	component of CE AM

Commandement Aérien Tactique (CATac)

Unit	*Name*	*Aircraft*	*Base*	*Role*
EC 1/3	Navarre	Mirage IIIE	BA133 Nancy-Ochey	pave-strike
EC 2/3	Champagne	Mirage IIIE		pave-strike
EC 3/3	Ardennes	Jaguar A		pave-strike
EC 1/4	Dauphiné	Mirage IIIE	BA116 Luxeuil-St Saveur	nuclear strike
EC 2/4	La Fayette	Mirage IIIE		nuclear strike
EC 1/7	Provence	Jaguar A	BA113 St Dizier-Robinson (det. Istres)	nuclear strike
EC 2/7	Argonne	Jaguar E/A		pilot conversion
EC 3/7	Languedoc	Jaguar A		nuclear strike
EC 4/7	Limousin	Jaguar A		nuclear strike
EC 1/11	Roussillon	Jaguar A	BA136 Roul-Rosières (det. Bordeaux)	close support
EC 2/11	Vosges	Jaguar A		pave-strike/ECM
EC 3/11	Corse	Jaguar A/E		overseas intervention
EC 4/11	Jura	Jaguar A		strike
EC 1/13	Artois	Mirage IIIE	BA132 Colmar-Mayenheim	strike
EC 2/13	Alpes	Mirage 5F		strike
EC 3/13	Auvergne	Mirage 5F		strike
ER 1/33	Belfort	Mirage IIIR	BA124 Strasbourg-Entzheim	tactical reconnaissance/strike
ER 2/33	Savoie	Mirage F.1CR		tactical reconnaissance/strike
ER 3/33	Moselle	Mirage IIIRD		tactical reconnaissance/strike
CPIR 339	—	Falcon 20SNA	BA116 Luxeuil-St Saveur	radar training

Though resembling the Dassault Mirage III/5/50 series in configuration, the Dassault-Breguet Mirage 2000 has a more curvaceous fuselage and much superior agility, thanks to the use of relaxed stability and electronically signalled flight controls. The result is a far more potent warplane.

ABBREVIATIONS

BA	Base Aérienne (air base no.)
BE	Base École (school base no.)
CIFAS	Centre d'Instruction des Forces Aériennes Stratégiques (strategic air forces instructional centre)
CPIR	Centre du Prédiction et d'Instruction Radar (fighter radar school)
EB	Escadron de Bombardement (bomber squadron)
EC	Escadron de Chasse (fighter squadron[1])
ECTT	Escadron de Chasse Tous Temps (all-weather fighter squadron[2])
EMS	Escadron de Missiles Stratégiques (strategic missile squadron)
ER	Escadron de Reconnaissance (reconnaissance squadron)
ERV	Escadron de Ravitaillement en Vol (inflight-refuelling squadron)

[1] fighter-interceptor, fighter-bomber, etc.

[2] historic title; CAFDA is completely all-weather

NOTE

Each CATac and CAFDA Wing (*escadre*) has a Section de Liaison et de Vol Sans Visibilité (liaison and instrument-rating flight), equipped with a small number of Holste Broussards and Aérospatiale Magisters. CoFAS wings have their component squadrons at different bases for greater security from attack. Instrument rating aircraft are loaned to squadrons by CIFAS 328.

Dassault Mirage F.1C of Escadron de Chasse EC 3/12 'Cornouaille' based at Cambrai. The unit's aircraft carry a scorpion emblem on the starboard fin side and a bulldog's head on the port side.